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FARM & HOME SCIENCE

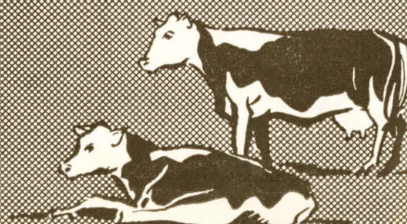
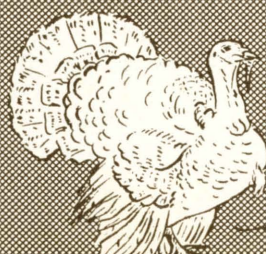
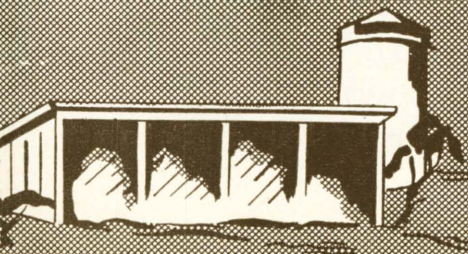
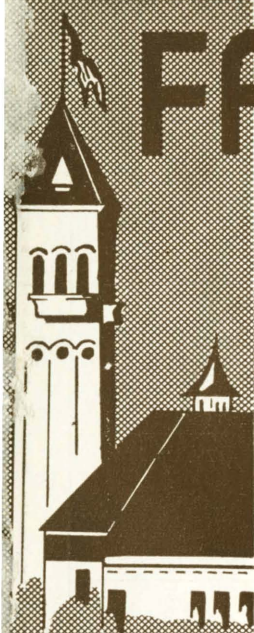
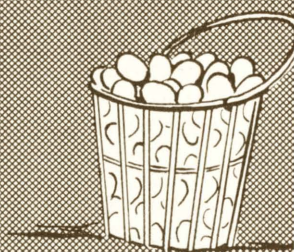
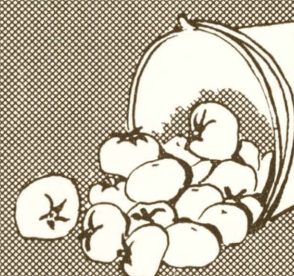
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How High Are Farm Prices?

Low compared with two years ago — high compared with prewar. In purchasing power some prices low — some high compared with 1935-39. Meat animals highest — potatoes, poultry low

GEORGE T. BLANCH and W. PRESTON THOMAS

THE MODERN farmer is much concerned with prices. The amount of produce sold times the price received per unit equals his total receipts. The amount of purchases times prices accounts for his expenses. Expenses deducted from receipts gives his net income. The amount of his net return divided by price equals the amount of consumptive goods and services he can buy. The farmer can do a great deal to determine the quantity of produce sold. He can also do much to determine the quantity of things he buys. However, there is little he can do to determine the prices he receives or the prices he pays. Prices are largely determined by forces over which he has no control.

Although he can do practically nothing to influence the level of prices received for the things he sells, he can determine the kinds of products he produces. This is important to him because prices of different commodities fluctuate differently. By taking advantage of price variations, he can influence his net returns.

This article will point out how the prices of some of the major farm products in Utah have changed since 1940. To do this each will be compared with the average price from 1935-39. This average will be called 100 and changes from this will be stated as a percentage

GEORGE T. BLANCH is head of the Department of Agricultural Economics and Marketing. DR. W. P. THOMAS was former head of the department and is now on part time teaching and research.

of the average. These percentages are also called indexes.

The selection of 1935-39 as the base for comparison is not to be interpreted as an indication that all prices were in proper adjustment at that time. It is a period when we were not at war, after the worst part of the depression had passed, and it has the advantage of being much more recent than the usual base 1910-14. The 1935-39 base is not used in the calculation of official parity prices. For most commodities these are calculated from the 1910-14 levels. For all Utah farm commodities the 1935-39 prices were about 7 percent greater than in 1910-14. The national average of farm costs in 1935-39, however, was about 25 percent above the 1910-14 level. Calculated on the 1910-14 level, Utah farm prices in 1935-39 were about 86 percent of parity. Some commodities were above average, and some below the average of all. If 1935-39 were used as the base, parity would, of course, be 100 for the period 1935-39.

Parity prices refer to the level of farm prices needed for a unit of farm produce to buy the same amount of goods and services as a unit would buy in the base period. (The official base for most commodities is 1910-14.) When the price for a given commodity is such that a unit will buy more than in the base period the price is said to be above parity. When it will buy less it is below parity. Thus "86 percent of parity" means that a unit of farm produce will exchange for 86 percent as many goods and services used by farmers for farm

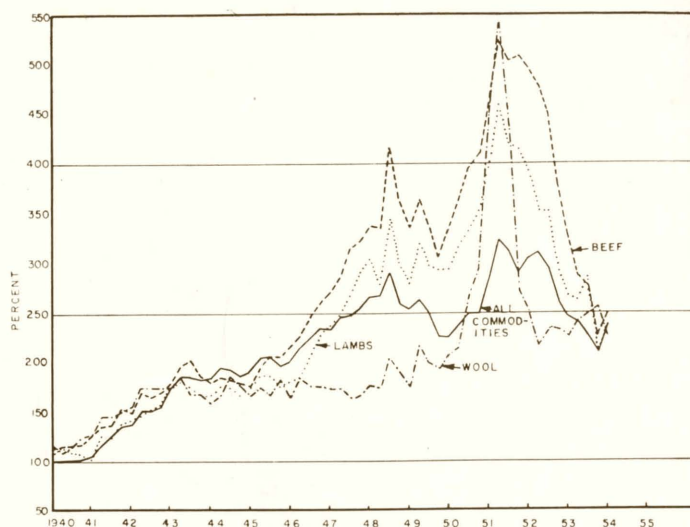


Fig. 1. Index numbers of prices received by farmers for selected meat animals and for all farm commodities, Utah, 1940-54. (1935-39=100)

production and family living as in the base period. There is a base and a parity price for each farm commodity and a composite for all commodities.

In interpreting the charts, it will be helpful to remember that World War II commenced in Europe in 1939, that the United States entered the war in December 1941. The shooting phase ceased in 1946, and the Korean hostilities began in June 1950. These events are important in accounting for many of the price changes.

All Commodities

All commodities include the major farm products that are produced for sale. Some commodities for which data are not regularly available or which are produced largely for consumption on the farm are not included. The index of prices received for any year is weighted by the volume sold during the previous five years.

The prices received for all commodities increased at a rather uniform rate from the beginning of 1941 to the fall of 1948 (fig. 1). During this period the gain amounted to more than 20 points per year (20 percent of the 1935-39 prices) or nearly tripled. This was followed by a rapid decline from the fall of 1948 to the spring of 1950. The outbreak of war in Korea started another upward trend that added about 100 points to the index by July 1951. This carried the index to 322 in June 1951, an all time high for which data are available. Since then the trend has been generally downward, being only

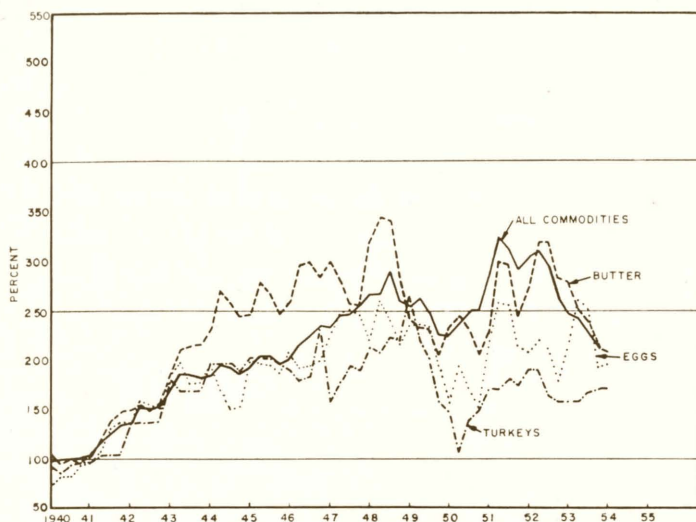


Fig. 2. Index numbers of prices received by farmers for selected livestock products and for all farm commodities, Utah, 1940-1954. (1935-39=100)

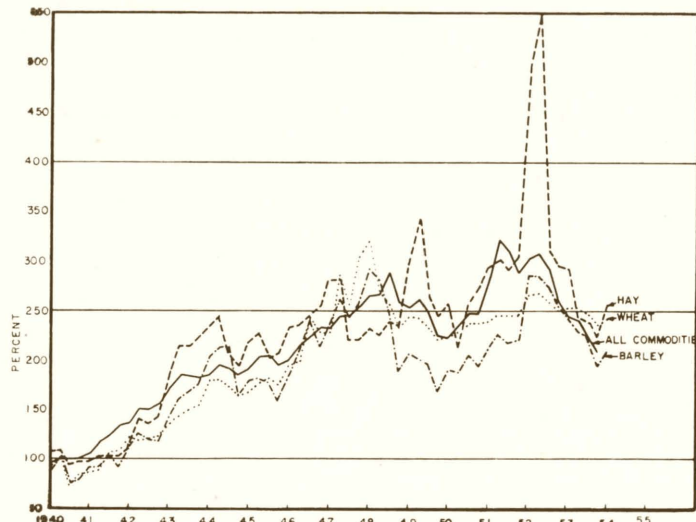


Fig. 3. Index numbers of prices received by farmers for selected feed crops and for all farm commodities, Utah, 1940-54. (1935-39=100)

slightly above 200 now. Farmers have been much aware of this decline in prices because their costs have remained essentially constant. This situation has been designed as a *cost, price squeeze*.

Just as the average of prices received by farmers has moved differently from the average of the prices paid by farmers, prices received for some farm products have moved differently from prices received for other farm products.

Beef, Lambs, and Wool

During most of the War II years, the prices of beef, lambs, and wool remained close together. They followed closely the average of all commodities. After

1945 they differed materially in the rate of changes. Prices for beef cattle took the lead and, while following the same general pattern as all commodities, attained much higher levels. In April 1951 the index reached a high of 523. It was above 400 for 25 consecutive months, while the peak for all commodities was 322. Much was made of the precipitous decline in beef prices, 523 in April 1951 to 228 in November 1953. Seemingly few realized the extraordinary heights to which beef prices had risen, or that when they reached the bottom, they were still above the average of all farm products. Many beef cattle producers took large paper losses, but those who

really got in difficulties were speculators, feeders who bought at peak prices, and those who bought into the business at the high level.

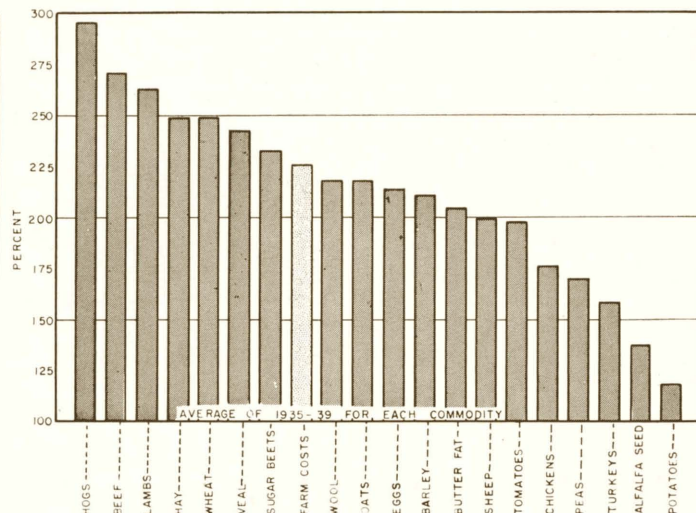
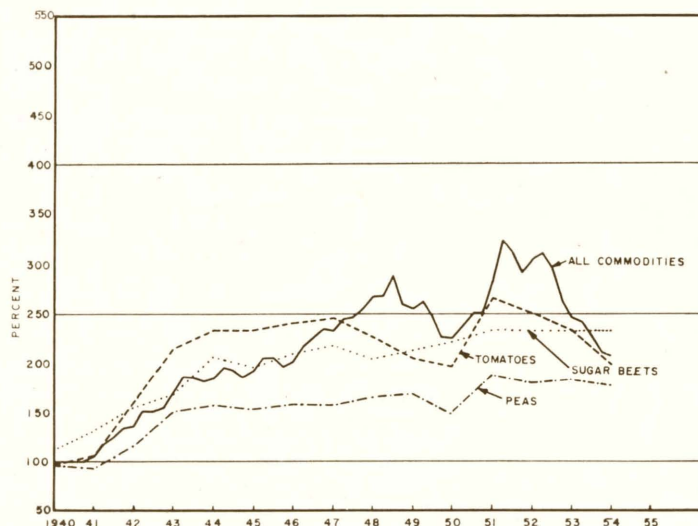
Lamb prices followed a price pattern similar but slightly less extreme than beef cattle prices. For some time, July 1943 to April 1947, lamb prices were below the average of all commodities. Since then they have been substantially above all commodities most of the time. In January 1954 they were at just about the same level.

Wool prices have been the least favorable of these products. Most of the

(Continued on page 45)

Fig. 4. Index numbers of prices received by farmers for selected contract crops and for all farm commodities, Utah, 1940-54. (1935-39=100)

Fig. 5. Index numbers of prices received by farmers for selected commodities and paid by farmers for production and living, Utah, March 1954. (1935-39=100)





Dr. Willard Gardner Closes Distinguished Career

He was first to draw attention to laws governing movement of water in soils and was influential in developing the potential concept of soil moisture retention and flow

JUNE 30, DR. WILLARD GARDNER, professor of physics, closes a career of 36 years as a member of the teaching and research staffs of the Utah State Agricultural College. During this time he has established himself as one of the leading soil physicists of the world. His picture hangs with five others in the Rothamsted Agricultural Experiment Station in England representing the men who have done most toward the advancement of agricultural science.

Two Outstanding Contributions to Science

He has made two outstanding contributions to science. He was the first to draw attention to the laws governing the movement of water in soils. He applied the Darcy velocity law to find the manner in which water moves into drains, into well networks, and into the ground-water reservoir from artesian water-bearing strata. The present science of drainage is built on his fundamental work. He was among the first to call attention to the fact that moisture is held in the soil with high energy and was influential in developing the potential concept of soil moisture retention and flow. This has completely changed the general concepts of soil-water-plant relations. He may well be known as the father of the science of soil moisture.

Inspiring Teacher

Dr. Gardner has inspired his students with the research spirit and today many of them are among the outstanding soil physicists of the country—L. A. Richards at the U. S. Salinity Laboratory; Byron Shaw, administrator of the Agricultural Research Administration of the U. S. Department of Agriculture; Sterling Richards, University of California, Riverside; Joel Fletcher, Soil Conservation Service,

Tucson, Arizona; and his sons, Walter and Hale, at Washington State College and Brigham Young University, respectively; N. Edlef Edelfson, University of California; Sterling A. Taylor, Utah State Agricultural College; Leon Linford, University of Utah; the late Eugene Gardner, and many others.

Dr. Gardner was born in Pine Valley, Utah, October 14, 1883. He received his B.S. degree from the USAC in 1912, his M.S. degree from the University of California in 1915, and his PhD. degree from the same institution in 1916. He returned to Utah as principal of the Murdock Academy at Beaver in 1916-17. During 1917-18, he was professor of physics and mathematics at the Brigham Young College. In 1918, he came to USAC as associate professor of physics. He became a professor in 1924. He was acting head of the department from 1943 to 1946 and head from 1946 to 1949. Since then he has been emeritus professor of physics. In 1950-51, he spent six months at Iowa State College as a visiting professor.

Dr. Gardner belongs to many scientific societies and has received awards from a number of them. He received the distinguished service award for his contribution in soil physics from the Utah Academy of Sciences, Arts, and Letters in 1940. He was selected to give the first faculty research lecture at USAC in 1942. He has been honored by the American Society of Agronomy and the Soil Science Society of America.

Dr. Gardner is the author of numerous scientific papers and bulletins on soil physics, soil moisture dynamics, soil erosion, and related subjects.

His explanation of the role of the physicist in the forward of his lecture on the *Scientist's concept of the physical world* sums up his philosophy:

To those who are aesthetic, there is perhaps nothing more inspiring than a beautiful sunset, with brilliant colors

above the horizon and with banks of dark clouds above, set in the deep blue of the heavens, or the brilliant hues of the rainbow forming a halo about the majestic mountain with its coat of green, purple, brown, or gray. By these things are the emotions stirred.

The physicist too is emotional but he is also at times realistic. He becomes sentimental but he also seeks to explain the behavior of nature. By means of devices and instruments his perceptual world is expanded. He tries to translate it all into numbers and equations. He seeks for invariance in a world that constantly changes. By the power of his intellect he achieves a measure of success; he discovers harmony in chaos, and he lays a foundation upon which the engineer and the artisan may build.

Of the things that are perceived and imagined he constructs his own world and modifies this conceptual universe from day to day to conform with the facts of observation and of experimentation. One generation builds upon the achievements of those preceding and hands them down, appropriately modified, to generations that follow. The facts and the realities persist, but the interpretations change.

The developments of the twentieth century in particular impress upon us the necessity of including with our concepts of nature the concept of endless change in the subjective world.

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GLADYS L. HARRISON, Editor

Address correspondence regarding material appearing in these columns either to the editor or to the author.

More detailed information on the subjects discussed here can often be found in Station bulletins and circulars or may be had through correspondence.

Farm and Home Science

Professor Charles J. Sorenson Retires From Staff

**Noted for his discovery
of damage to alfalfa
seed crop caused by
the lygus bug his
research has meant
millions to the seed
industry**



AFTER A LIFETIME of service to the Utah State Agricultural College, Professor Charles J. Sorenson will retire June 30, 1954. Professor Sorenson has been employed by the College for 34 years, from 1914 to 1920 and from 1926 to 1954. During this period he has made an outstanding contribution both to the College and to the state in research in agricultural entomology and in the teaching of entomology and zoology.

Professor Sorenson began his experiment station work in 1926 with an investigation of the alfalfa and clover seed chalcid problem. While engaged in this work he became impressed with the importance of lygus bugs in relation to alfalfa seed production. He was the first worker in the United States to recognize and demonstrate experimentally the kind and seriousness of injury done to seed alfalfa by these insects and to call attention to it. He worked out the life history of the lygus bug in alfalfa and found that it could not be controlled with any of the insecticides then known. When DDT became available in 1945 Professor Sorenson, in collaboration with Dr. John W. Carlson, F. V. Lieberman, and others, found that lygus bugs could be successfully and economically controlled with this new insecticide. These contributions have been a major factor in saving the alfalfa seed industry in Utah.

Other significant contributions of Professor Sorenson were made in the following studies: (1) life history of the superb plant bug, which also causes injury to seed alfalfa in some years; (2) biology and control of the pale western cutworm, a serious pest of dry-farm grain; (3) distribution, biology, and control of the Mormon cricket; (4) life history and control of the peach twig borer; (5) studies of lygus bug injury to maturing peach fruits and to other crops.

Professor Sorenson has also studied individually or in collaboration with other staff members the alfalfa weevil, the peach tree borer, treehopper injury in orchards, the biology and control of cattle grubs, adult honey bee losses as related to arsenic poisoning, and other problems in entomology.

In 1946 Professor Sorenson was honored by being invited to give the Fifth Annual Faculty Research Lecture, entitled "Mirid-bug injury as a factor in declining alfalfa-seed yields." He has published 59 articles and two more are ready for publication. In recent years he has been chiefly engaged in an investigation to determine the most effective controls for insects and mites causing injury to orchards. This work has been done in collaboration with Dr. S. W. Edgecombe and Dr. R. M. Bullock, horticulturists

of the Utah Agricultural Experiment Station.

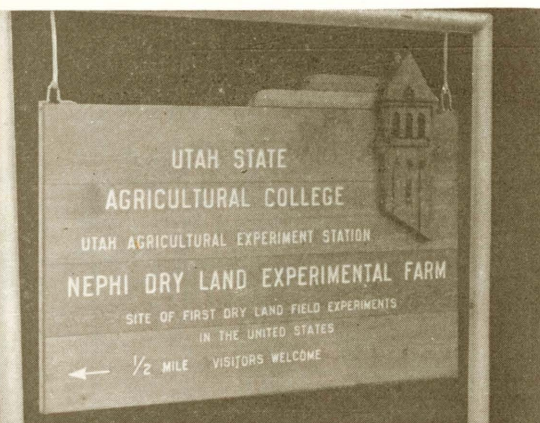
Professor Sorenson was born in Hyrum, Utah, May 3, 1884. He received his B. S. degree from the USAC in 1914 and his M. S. degree in 1927. He was instructor in zoology from 1914 to 1916 and assistant professor of zoology from 1916 to 1920. He taught courses in general zoology, parasitology, comparative anatomy and genetics. During the summer of 1916 he studied at the Marine Biological Laboratory of the University of Washington where he was laboratory instructor in zoology, and in the summer of 1919 he studied zoology at the University of California.

In 1920 he resigned his position at the USAC because of ill health resulting from influenza in the 1918 epidemic. In 1921 he took a position as county agent in Weber County. From 1922 to 1926 he was district agricultural inspector for Utah, Juab, and Wasatch Counties in the employment of the U. S. Department of Agriculture and the state of Utah. In 1926 he returned to the USAC as research assistant entomologist in the Experiment Station. In 1931 he was made associate entomologist, in 1938 research associate professor of entomology. In 1949 he became emeritus professor of

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Long-Time Research on Dry Farming Methods Establishes Pattern for Successful Practices

Climate — important factor in yields of dry land crops



By W. H. BENNETT

THE NEPHI FIELD STATION is the oldest dry-land experimental farm in America still in operation. It was established in 1903 by action of the Utah Legislature and has been in continuous operation ever since. Five other arid experimental farms were established in Utah at the same time as the Nephi Farm, but they were all discontinued prior to 1920.

When the Nephi Station was established, dry farming in Utah was in its infancy. Furthermore, this type of farming was uncertain because no one was familiar with methods of moisture conservation and with crops adapted to the conditions. No reliable information was available; the only knowledge at hand was empirical based on the experience of a few successful dry farmers. There were some successes in the early attempt at arid farming, but there were also many failures.

Since 1903 dry farming has undergone considerable change and expansion.

WILLIAM H. BENNETT is associate professor of agronomy. He was in charge of the Nephi Experimental Dry Farm in 1948 and is now in charge of the grass experiments at the farm. PROF. PITTMAN has been in charge of the general operations on the farm since 1951.

sion and it now represents an important phase of the agricultural economy of the state. By 1949 there were 576,300 acres of dry farm land in Utah. This represented 33 percent of the total cropland. Additional land has been cleared for dry farming since then. Since dry farm land in Utah is used principally for the production of winter wheat, expansion in dry farm acreage has meant an expansion in winter wheat acreage and production.

Throughout the entire period of expansion changes have taken place in dry farming methods and procedures. Operations have become highly mechanized, machinery has been greatly improved, and better cultural practices have been adopted. The research work carried out at the Nephi Station since 1903 has aided greatly in making these advancements possible, and has done much to improve, unify, and stabilize dry farming practices in Utah and in the West.

Location of Farm

The Nephi Dry-Land Experimental Farm is located about five miles southwest of Nephi, Utah, on an alluvial fan locally known as Levan Ridge. The topography is smooth with slopes of about 2 percent.

Soils

A recent (1952) survey showed that the soils are reasonably uniform over a large portion of the farm. The soils were classified as Nephi silt loam and Nephi loam. The organic matter content of the surface soil varies from 1.4 to 2.4 percent, the pH from 7.5 to 8.2, calcium carbonate from 3 to 13 percent, available phosphate from 5 to 23 parts per million, and available potassium from 70 to 187 parts per million. The water table is deep.

Climatic Conditions

Crop yields on dry farm land are influenced greatly by climatic factors. The most successful crop production requires that these factors be evaluated carefully and that practices be fitted to the climate.

Four climatic factors have been measured at the Nephi Farm: precipitation, temperature, evaporation, and wind velocity.

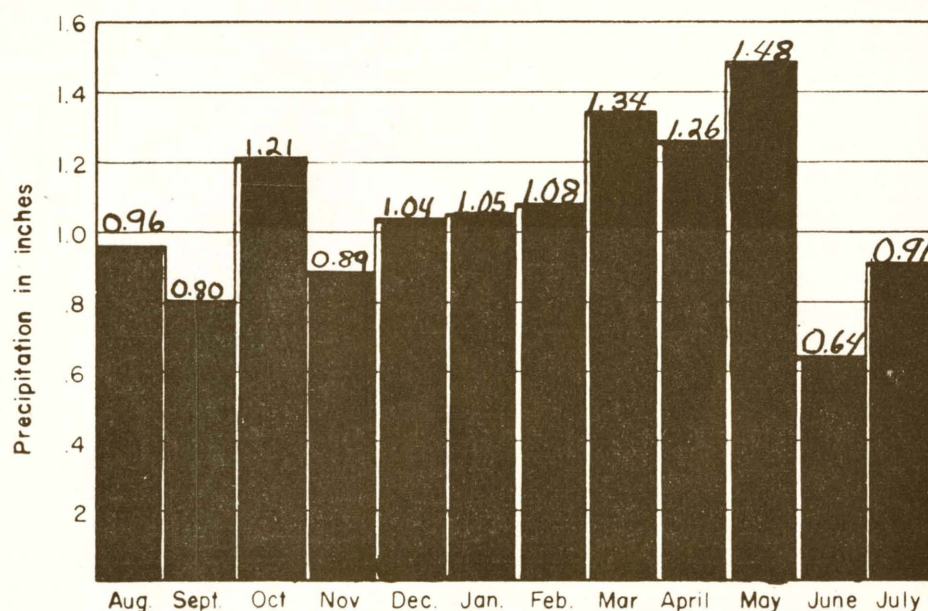


Fig. 2. Average monthly precipitation at the Nephi Experimental Dry Farm 1903-1953, inclusive

Average annual precipitation, 1903 to 1953, inclusive, (fig. 2) was 12.65 inches (August 1 to July 31 basis). The two extremes were 6.00 inches for the 1933-34 crop year and 19.08 inches for the 1913-14 crop year. May was the wettest month and June the driest. Spring precipitation had a significant effect on crop yield as did total annual precipitation, and two years' precipitation. July through October rainfall and November through February precipitation were not significantly correlated with yields.

High yields of dry farm winter wheat were found to be directly associated with fall emergence. High spring rainfall was unable to overcome the detrimental effects of poor fall emergence.

The average frost free period was 110 days.

The average monthly mean temperatures obtained over the 33 year period 1909 to 1941 are shown in fig. 3. Mean temperatures give a fair measurement of climate, but maximum and minimum daily temperatures are sometimes more important in crop production because they represent the extremes to which plants are subjected. High summer temperatures at the Nephi Station have resulted in low crop yields when moisture has been deficient, and low temperatures in winter and early spring, in combination with other factors, have caused winter injury in some years.

April had the highest average wind velocity and October the lowest. The monthly variation was slight, however (fig. 4).

Average total evaporation from April through October was 47.79 inches. The

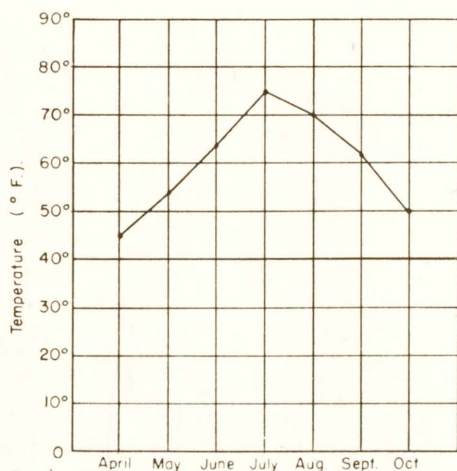


Fig. 3. Average monthly mean temperatures, April to October for the period 1909 to 1941, inclusive

The Nephi Station has had a most interesting history. Many of the men who were closely associated with it during its early days subsequently distinguished themselves as outstanding leaders. The Station has produced a secretary of agriculture and minister to Egypt, four college presidents, three experiment station directors, a director general of the United Nations Food and Agriculture Organization, a chief of the Rice Improvement Program in the United States, and an apostle in the Mormon Church.

average monthly evaporation, April to October for the period 1908 to 1941, inclusive, is shown in fig. 5.

Experiments and Results

Investigations at the Nephi Station have covered most of the problems of dry land agriculture. Many different types and kinds of experiments have been conducted, including crop adaptation trials, cereal varietal testing, forage tests, grass seed production, tillage trials, fertility experiments, rotation studies, rate and depth of seeding investigations, and a number of miscellaneous studies.

Cereal Varietal Trials

Winter wheat proved to be the best adapted and most profitable crop. Utah Kanred and Turkey 926 were the highest yielding varieties. However, they are both susceptible to smut. Cache yielded almost as well and is recommended because it is resistant to smut. Wasatch was decidedly inferior in yield.

Winter wheat yielded almost twice as much as spring wheat.

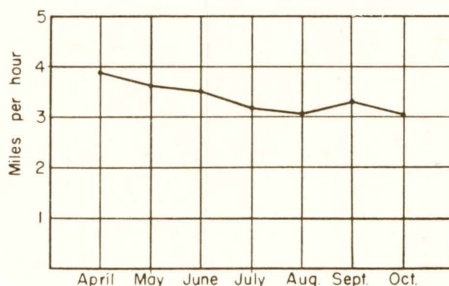


Fig. 4. Average wind velocity, April to October, for the period 1909 to 1941, inclusive

Forage Tests

Tall and pubescent wheatgrasses gave the highest yields of forage (hay stage). Alfalfa and an alfalfa-crested wheatgrass mixture gave high forage yields in some years but low yields in others. Rye gave good forage yields but should not be planted on farms growing winter wheat because it can get out of hand and become a weed pest. Intermediate, pubescent, and crested wheatgrasses showed considerable promise for spring pasture. It was difficult to get good stands of small-seeded grasses and legumes in some years.

Growing Grasses for Seed

Seed production studies have been carried out on tall, intermediate, pubescent, and crested wheatgrasses since 1948. It was more difficult to get a good stand of crested wheatgrass than of the other species. However, after it was established, crested wheatgrass was a more consistent and dependable seed producer. Pubescent ranked next to crested in this respect. Tall wheatgrass gave the highest seed yields in years when precipitation was favorable, but was not able to produce a seed crop under dry conditions. Intermediate wheatgrass was not promising as a seed producer. In most cases row seeding gave higher seed yields than solid seedings. The 48 inch row spacing appeared to be superior to the 30 inch spacing for tall and intermediate. Crested and pubescent yielded

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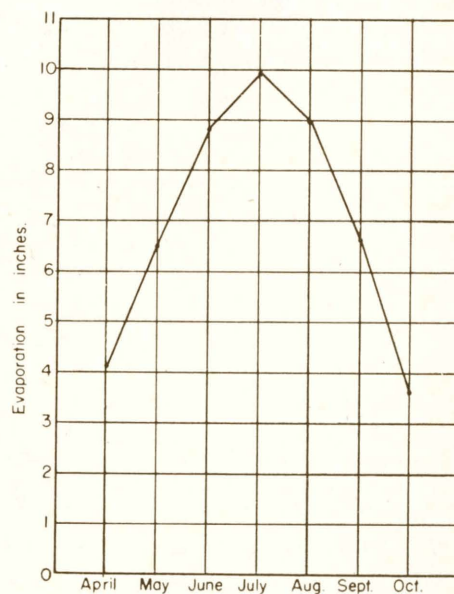


Fig. 5. Average monthly evaporation from free water surface, April to October, for the period 1908 to 1941, inclusive

Sprinkler Irrigation

irrigation systems in Utah. These studies have given some indication that labor costs for sprinkler systems in Utah are not as important as they are in some of the other Western States. However, the interrelation between labor costs and effectiveness of operation of the sprinkler systems is important, and detailed studies along this line are continuing at the present time.

The area of land irrigated by sprinklers is expanding rapidly. Sprinkler systems provide an excellent means of controlling the water and using existing supplies effectively, provided the systems are properly designed and are used under the conditions for which they were designed. Many farmers, however, do not attain maximum efficiency with their sprinkler irrigation systems and it is an objective of the current studies to determine the reason for this.

Sprinkler irrigation systems represent a considerable investment by the farmer, and if he is to obtain the optimum return on this investment, he should know something of the factors involved in the design and use of them.

The studies in Utah during 1953 were concentrated on a relatively small number of northern Utah farms. It is planned during the 1954 irrigation season to extend this study over a larger number of farms.

Results obtained indicate that the labor requirements were related to the time allowed per setting on each farm. For example, on three of the farms



Orchard irrigation using an under-tree low-angle sprinkler nozzle
(Photo courtesy J. R. Barker)

DEAN K. FUHRIMAN

WHETHER OR NOT to buy a sprinkling system is a question being considered by many irrigation farmers in Utah. There are many factors to be considered before a decision to purchase a sprinkling system is made. The main factor, however is one of economics and whether the gains will justify the greater costs.

DR. DEAN K. FUHRIMAN is associate professor of irrigation and drainage.

A farmer moving a sprinkler lateral used in irrigation of potatoes
(Photo courtesy W. R. Ames Co.)

Preliminary work was started by the Utah Station during the past irrigation season on a research study to evaluate labor costs and effectiveness of sprinkler



Labor costs and effectiveness studied

studied the irrigation schedule called for a four hour setting. This was the shortest time period of irrigation on any of the farms and the amount of water applied in the four hours was usually rather small, with the result that the labor requirement per acre-inch was higher in this group than in any of the others, with a range of 0.23 to 0.32 man-hours per acre-inch of water applied. One farm used a six hour setting and had an average labor requirement of 0.07 man-hours per acre-inch of water applied. Other farms included in the study used 7, 12, and 24 hour settings with 0.05, 0.12, and 0.11 man-hours per acre-inch of water being used, respectively. On the farm using a 24 hour setting, the total application per irrigation was 6.5 inches. Although the moisture storage capacity of the soil was not determined, it is probable that some of this water was lost by deep percolation from the field. It is important for the farmer to realize that every soil has a definitely limited capacity for storage of water. This capacity differs with the relative amount of moisture in the soil at the time the irrigation is started. The farmer should, therefore, have some knowledge of the storage capacity of his soil and cor-

Before buying a sprinkler system, it is well to know some of the advantages and disadvantages.

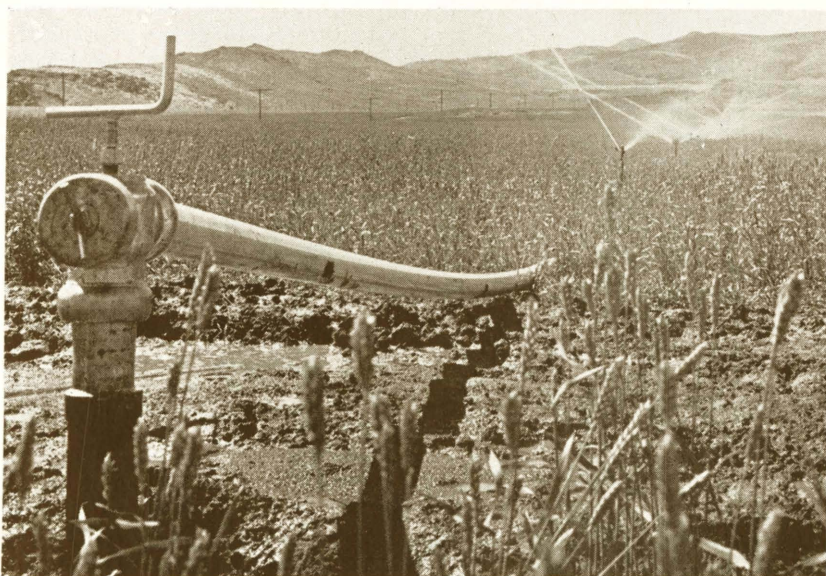
Advantages

- Porous and uneven soils are irrigated more efficiently, often saving 50 percent or more of the irrigation water that would be required by surface irrigation.
- Soil erosion resulting from surface irrigation can be reduced or eliminated.
- Land is saved by eliminating ditches, furrows, borders, and corrugations. These items may require 5 percent of the total acreage.
- Steep, porous soils which are difficult or impossible to irrigate by surface methods can be irrigated efficiently by sprinkler.
- Drainage problems are lessened because water is seldom lost to deep percolation.
- Unskilled labor can be used at regular hours to do the irrigating.
- New crops are much easier to start, especially on steep, sandy soils.
- New rough land can be brought into production faster.
- Liquid fertilizer can be applied through the sprinkler system.

Disadvantages

- A large initial capital outlay is required.
- Large annual expense is incurred for power, repair, and replacement of equipment.
- Power or equipment failure may cause a crop failure, unless an alternate means of irrigation is provided.
- Clogging of nozzles by trash is annoying; special trash collection and desilting structures are often required.
- Wind prevents even distribution of water.
- Changing of laterals immediately after sprinkling on clay soils is an unpleasant task because of slick and muddy conditions.

These advantages and disadvantages were prepared by James R. Barker, extension irrigation specialist, and Vaughn E. Hansen, research associate professor of irrigation, as a part of an extension circular on sprinkler irrigation.



Sprinkler irrigation of a wheat field with lateral connection to a buried main line (Photo courtesy the W. R. Ames Co.)

relate the amount of water he applies in each irrigation to the soil storage capacity available at that time.

Early in the growing season many crops use water only from a rather shallow layer of soil near the ground surface and require water when only a relatively small amount has been removed from the soil. In these cases, light frequent applications of water are much more effective than heavier applications spaced at longer intervals of time.

Labor Studies in Other States

A few studies have been made on labor costs involved in the use of sprinkler systems in other states of the West. The most extensive of these was made in California, where 37 different systems in the Sacramento Valley were studied. It was found that from 1.0 to 3.7 man-

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With present prices

Pelleted High Barley Rations Decrease Turkey Feed Costs

Since 60 percent of cost of producing turkeys is feed, this is good place to reduce costs

By J. O. ANDERSON

cultural Experiment Station last year points a way to cheaper production.

About 70 percent of the feed consumed by a Broad Breasted Bronze turkey is grain or grain products. Wheat and barley are the main grains produced by Utah farmers. Price supports have made wheat so high in price that few turkey growers can feed it. This means that growers must either use barley and wheat mill feeds or buy corn and milo from the Midwest. Barley and wheat mill feeds are higher in fiber and more bulky than corn or milo. Mashers made with large amounts of wheat, corn, and milo are termed high energy feeds, while those with large amounts of barley, wheat mill feeds, and alfalfa are termed low energy feeds.

DR. JAY O. ANDERSON is assistant professor of poultry husbandry. He is a graduate of the USAC and the University of Maryland. Before returning to USAC as a member of the staff he worked for Merck and Company.

A comparison was made at the Station during 1953 between these two types of rations. Since pelleting high fiber feeds usually increases their value, the low energy ration was also fed in pellet form. In the high energy, growing mash corn and wheat were the only grains. Wheat was also fed free-choice during that latter part of the growing period. The low energy growing mash contained 36 percent barley and 10 percent mill-run. Barley was also fed free-choice during the latter part of the growing period. The composition of the two growing mashes which were fed from the tenth to the twenty-sixth week is given in table 1. The diets fed from the sixth to the tenth week were similar to the growing mash, but with a slightly higher protein content.

The feed consumption per pound of gain is shown in fig. 1. It required about 4.0 pounds of the high energy feed or about 4.5 pounds of the low energy feed to produce a pound of turkey. Pelleting the low energy mash made it equal in feed efficiency to the high energy mash.

Production of heavy breed turkeys is expected to exceed 1953 figures by about 10 percent. Cost of some feed-stuffs will be higher. Both these factors mean that turkey growers must be more efficient this year to make a profit

CHEAPER AND more efficient methods of growing turkeys are always being sought by turkey producers. This year's record turkey crop makes it even more important. Since 60 percent of the cost of producing turkeys is feed, this is a good place to reduce costs. An experiment conducted by the Utah Agri-

The cost of producing a pound of gain is most important to the grower. The black bars in fig. 1 give the cost of feed ingredients per pound of gain under the prices existing during the 1953 growing season. It may be noted that the ingredient cost per pound of gain was one-half cent less with the low energy than with the high energy feed. This was true even though it took one-half pound more low energy feed per pound of gain. The relatively low price of the barley and mill-run last year made this possible. Even greater savings, another 0.8 cents per pound gain, was made by pelleting the low energy mash. The ingredient cost of the low energy pellets includes three dollars per ton for the pelleting operation.

The final weights of all three groups of birds were not greatly different. Those fed pellets were heaviest, followed by the birds fed high energy mash.

Other experiment stations have conducted experiments on the value of pelleting turkey rations. Generally, pelleting the feed has increased growth rate and feed efficiency. The increase in feed efficiency usually has not been as high as in this experiment. The difference may be because large amounts of barley were used in our experiment. Similar experiments have also been conducted with laying hens at this station. In these experiments, pelleting high barley mashes has increased their value more than pelleting other types of high fiber rations. Evidently, high barley mashes are not as palatable as mashes with equal fiber from feedstuffs like wheat bran. As palatability of a ration decreases, the value of pelleting is usually more apparent.

In addition to increased growth rate and feed efficiency, there are other ad-

Table 1. Composition of turkey growing mashes

| Ingredients | Percent of mash | |
|--|-----------------|------------|
| | High energy | Low energy |
| Wheat, ground | percent 28 | percent 5 |
| Corn, ground | 28 | 5 |
| Barley, ground | --- | 36 |
| Mill-run | --- | 10 |
| Fish meal (62 percent protein) | 4 | 4 |
| Meat and bone meal (50 percent protein) | 7 | 7 |
| Soybean meal (44 percent protein) | 20.5 | 20 |
| Alfalfa meal (sun-cured) | 4 | 5 |
| Whey | 4 | 4 |
| B-vitamin suppl. (riboflavin, niacin, pantothenic acid, choline) | 0.2 | 0.2 |
| Limestone flour | 1.75 | 1.75 |
| Bone meal | 1.5 | 1.0 |
| Salt | 0.5 | 0.5 |
| Vitamin A and D suppl. (2000A-300D) | 0.5 | 0.5 |
| Penicillin suppl. (4 gm. procaine penicillin per pound) | 0.1 | 0.1 |

vantages that might be listed for use of pelleted feeds. There is usually less waste

from the wind and billing out of pelleted feeds. There is less clogging of self feeders and less storage space required. Handling of pellets does not cause unmixing, and feed intake by the birds is more uniform.

There are some disadvantages too with pellets. The cost of the pelleting must be considered. Whenever pellets are fed, there is greater tendency towards feather picking. Flocks being fed pellets should be watched closely for tendencies toward this habit. If it starts, it may be necessary to debeak the birds or use some other control measure.

The value of the high barley feeds depends upon the relative price of barley and other grains such as corn, milo, and wheat. Last year in Utah, there was definite advantage with the barley. Present indications are that there will be an equal or greater difference this year. If this is the case, Utah turkey growers can decrease feed costs by feeding high barley rations in the pellet form.

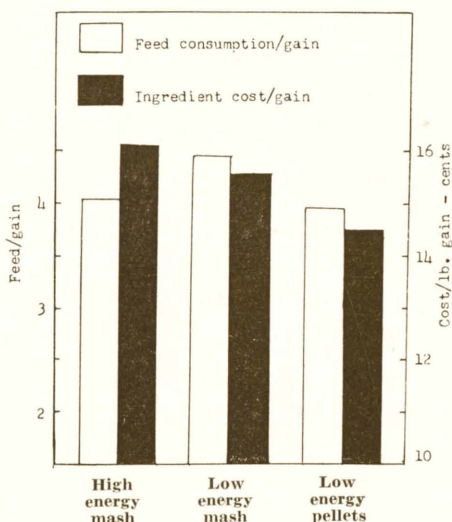


Fig. 1. Feed consumption and ingredient cost per pound of gain by turkeys

Can Butter Compete With Oleo?

WELLS ALLRED

BUTTER OR OLEO—which will it be? This is an important question for people in Utah where dairying ranks high as a producer of farm income. Currently housewives in Utah are buying from grocery stores more than 3 pounds of oleo to each pound of butter. These facts were obtained by the Utah Station in a recent survey of 83 grocery stores in Utah.

DR. ALLRED is assistant professor of agricultural economics.

Grocery stores whose clients were largely low income were selling 4 1/3 pounds of oleo to one of butter. Medium income customers purchased 3 1/2 pounds of oleo to 1 of butter, compared with housewives in high income areas where 2 pounds of the spread were purchased for 1 of butter.

Surprisingly the ratio of oleo to butter sales was higher among farm than city customers. Stores located in farm areas sold 3 1/2 pounds of oleo to 1 of butter compared with 3 pounds of the

substitute spread to 1 of butter sold in stores whose clients were largely non-farm.

For the country as a whole consumption of butter and oleo is approximately equal. Part of the difference between the United States consumption pattern and the Utah ratio of oleo to butter store sales is that additional quantities of butter are sold on milk routes and through restaurants and other institutions. This probably accounts for the higher ratio of

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Phosphorus Supplements Made More Palatable With Salt

By MILO L. DEW, GEORGE E. STODDARD,
and GEORGE Q. BATEMAN

Phosphorus deficiency in high producing dairy cows prevented by mixing salt with less palatable phosphorus supplements

DAIRY COWS allowed free access to various mixtures of salt and steamed bone meal showed a preference for mixtures with higher amounts of salt in trials at the Utah Agricultural Experiment Station. Mixtures containing 50 to 75 percent salt induced the highest consumption of steamed bone meal, which, by itself, is unpalatable. Salt with no added steamed bone meal was most palatable,

and when available reduced consumption of all mixtures. Cows allowed access to mixtures of salt and steamed bone meal will likely consume sufficient amounts to reduce or eliminate phosphorus deficiencies that might occur in high producing cows.

Frequent changing of minerals improved palatability and increased consumption of all mixtures.

MILO L. DEW is research assistant, and DR. GEORGE E. STODDARD and GEORGE Q. BATEMAN are associate professors of dairy husbandry. Mr. Bateman is also superintendent of the Dairy Experimental Farm.

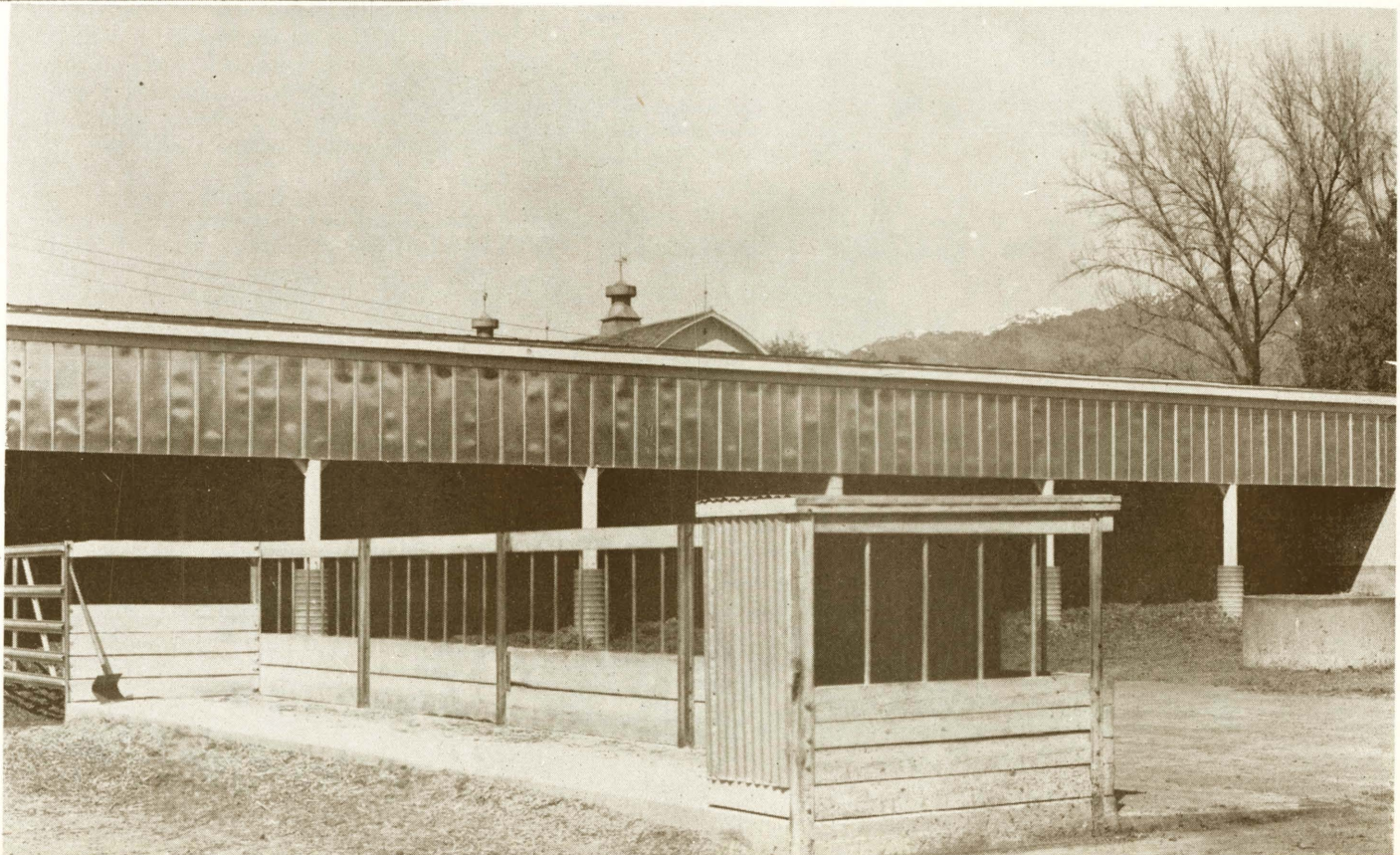
Phosphorus Likely To Be Deficient

Of the many minerals required by dairy cows, salt and phosphorus are most likely to be deficient in feeds. Salt is palatable, inexpensive, and easily sup-

(Continued on page 44)

The illustration on the left shows the mineral box used in this study for feeding the different mineral mixtures. The box is built as part of the manger and is covered and protected from the weather on two sides. The other two sides are left open allowing the cows free access to the mineral mixture. The box is divided to hold the different mixtures

Through careful planning in the placement of the salt-mineral box, mangers, and watering facilities with relation to the bedded area under the open shed, it is possible to feed the herd more efficiently and protect the bedded area from traffic lanes across it



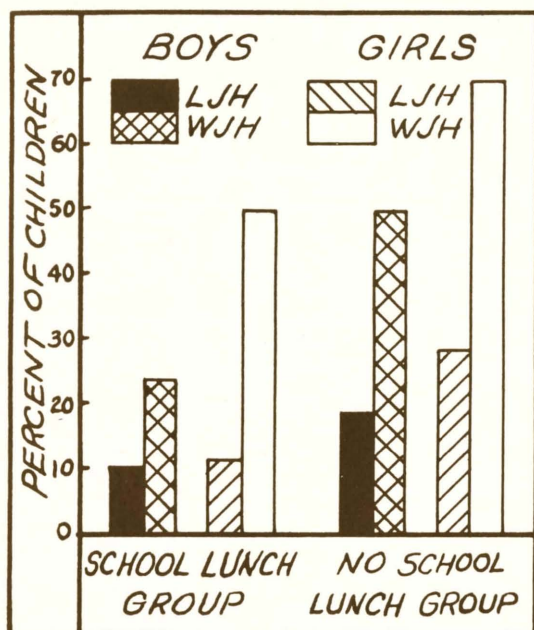


Fig. 1. Percent of children missing breakfast at least once during the week

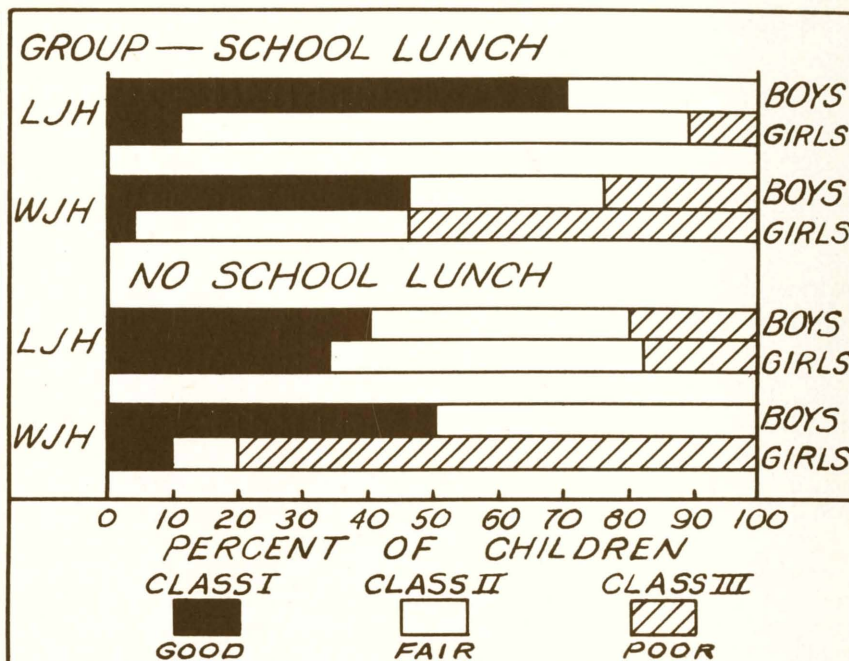


Fig. 2. Percentage distribution of children according to breakfast classification

Many Teenagers Begin Day With Poor Breakfast

LEORA GALLOWAY and
ETHELWYN B. WILCOX

Studies show that both children and adults should get from a fourth to a third of their calories and protein at breakfast

NUTRITIONISTS maintain that breakfast is the most important meal in the day and should supply from a fourth to a third of the required calories and protein; yet many school children fail to eat adequate breakfasts, and this deficiency in their diet is not made up in the other meals of the day. This statement is confirmed by a study of junior high school students in Logan and Wellsville, Utah. Too many of these children missed breakfast or did not have the proper kind of foods.

A well-balanced breakfast is vitally important to the rest of the day's diet. Many studies have shown that people in general feel better and work better after a breakfast containing at least a fourth of their total day's calories and protein. The favorable effect in the breakfast of protein foods such as eggs, meat, or milk

may be the result of the relatively slower digestion and absorption by the body as compared to carbohydrate foods such as bread, jelly, or fruits. It is reasonable to believe, therefore, that breakfast is an important factor in the health, behavior, and learning of school children.

Various studies in Iowa, Maine, New York, and elsewhere have shown that breakfasts of many teenagers are poor. The breakfast habits of Logan and Wellsville Junior High School children in Utah were part of a study made in the spring of 1953 of the relation of the school lunch and other meals to the total adolescent's nutrient intake. One hundred and fifty-two children 13 to 15 years of age were included in this study. At the Logan Junior High School 44 girls and 47 boys of the 8th grade participated, while at the Wellsville Junior High School there were 40 girls and 21 boys of the 8th and 9th grades. All children who volunteered to keep their dietary records for 7 consecutive days were allowed to participate, including those who did not eat a school lunch as well as those who did.

Complete and thorough instructions were given each pupil, both written and oral, on how to measure and keep his food record, which was recorded each day in a dietary booklet. Foods were recorded in number of servings or estimated household measures.

How the Breakfasts Rated

School children in this study did not habitually miss breakfast. Only one girl in the entire group failed to eat breakfast any day of the seven. The girls (37 percent) as a whole tended to miss this meal more frequently than did the boys (21 percent).

The percent of children missing breakfast at least once during the week is shown in fig. 1. There was a greater difference in percentage between Logan (19 percent) and Wellsville children (36 percent), than between those children receiving a school lunch (32 percent) and those who did not (28 percent). Could this difference in the number missing the breakfast meal between the two schools

(Continued on page 43)

Mrs. GALLOWAY is a research assistant and DR. WILCOX is professor in the Department of Foods and Nutrition. The data reported here are part from the thesis of Leora Galloway presented in partial fulfillment of the requirements for the degree of master of science.

How Harmful Are the Newer Insecticides to Domestic Animals and Human Beings?

CLYDE BIDDULPH, D. A. GREENWOOD, L. E. HARRIS, C. I. DRAPER,
G. Q. BATEMAN, GEORGE E. STODDARD, WAYNE BINNS, M. L. MINER,
C. J. SORENSON, and F. V. LIEBERMAN

NEW AND MORE powerful insecticides are being introduced every year. While these have proved their worth in the control of harmful insects, health authorities are wondering if they may also be harmful to human beings, especially when they are used on crops consumed by domestic animals and by human beings.

To answer some of these questions, researchers at the Utah Agricultural Experiment Station during the past five years, assisted by funds from the U. S. Public Health Service, have made intensive studies of a number of these insecticides used to dust alfalfa. Hay dusted with these various insecticides—DDT, methoxychlor, toxaphene, chlordane, and

The research on toxicity of insecticides has been cooperative among the Departments of Zoology, Entomology, and Physiology; Chemistry; Animal Husbandry; Poultry Husbandry; Dairy Husbandry; and Veterinary Science. It has been partially supported from funds from the U. S. Public Health Service.

aldrin—in different amounts has been fed to domestic animals and their tissues and products analyzed for the presence of the insecticide. Work is now in progress on the toxicity of dieldrin, endrin, and heptachlor.

Experimental results have shown that residues of insecticides remain on plants after their application to alfalfa and other forage crops. These residues are ingested by farm animals consuming such forage and in the case of DDT, at least, considerable quantities of this substance accumulate in the fatty tissues, and lesser amounts in other tissues. Furthermore, this insecticide appears in the milk and eggs of animals consuming such treated hay. The presence of this insecticide in foods consumed by man presents an important public health problem, particularly since the amount of DDT present in these products is considerably above the tolerance levels suggested by the Food and Drug Administration.

DDT accumulates in considerable quantities in the milk of dairy cows, the eggs of chickens, and in the tissue

of sheep, dairy cows, and chickens when they are fed DDT or alfalfa hay containing DDT residues. Small quantities of DDT were present in the bloodstream of dairy cows after they had consumed DDT treated hay for approximately four months' time. There was no noticeable pathology produced in any of the sheep, dairy cows, or chickens fed DDT, or hay containing DDT residue, but turkey poulters were killed by 200 parts per million.

Methoxychlor, toxaphene, chlordane, and aldrin were less persistent.

A review of the research results follows:

DDT

Investigators in Utah and other areas have shown that in the production of alfalfa seed, alfalfa weevil and lygus bugs are effectively controlled by the application of DDT to the alfalfa. The great increase in alfalfa seed yields, resulting from the use of DDT, has stimulated widespread interest in its use in alfalfa hay production.

In the insecticide toxicity studies the alfalfa was treated with the insecticides using a power sprayer. It was harvested as hay seven to ten days later for feeding to the experimental animals



In order to get data upon which to make safe insect control recommendations, these investigations were undertaken in the spring of 1947 to determine whether residual quantities of DDT on alfalfa hay caused any toxic effect when such hay was fed to lambs, dairy cattle, swine, chickens, and turkeys. Furthermore, tissues of lambs and swine, and butter from dairy cattle that consumed DDT-treated hay were fed to rats.

All experiments were planned and carried out so as to duplicate as nearly as possible procedures that might be used by farmers in dusting the alfalfa with DDT, harvesting the alfalfa hay, and feeding the hay to farm animals. The length of the period of feeding was approximately the same as used by farmers of this area.

Sheep

Feeding of DDT-dusted Hay to Lambs

Plots of alfalfa were dusted with 1, 2, and 4 pounds of technical DDT per acre. This alfalfa as well as alfalfa from untreated plots was harvested and fed to lambs. Untreated alfalfa hay was also fed to lambs along with DDT in capsules at the following amounts in parts per million of hay: 0, 50, 100 and 200. The lambs were fed approximately 50 percent hay and 50 percent grain. Eight lambs were fed each level of DDT-dusted hay and DDT in capsules for 112 days. Thus a total of 64 lambs were used.

The average DDT residue on the alfalfa hay was 0, 12, 22 and 42 ppm

SPRAYING RECOMMENDATIONS

As a result of these studies each insecticide tested has been recommended for use in controlling alfalfa insects to the extent that the findings showed was safe. Methoxychlor has been recommended for control of alfalfa weevil larvae at the rate of 1 to 2 pounds per acre; no harvesting or feeding restrictions are necessary. Heptachlor at $\frac{3}{4}$ to 1 ounce per acre may be used to control weevil larvae if the crop is not cut for 3 days. (Results of research on the toxicity of this insecticide are not yet ready for publication.) Aldrin provides good control of weevil larvae or grasshoppers and may be safely used if the treated crop is not harvested for 15 days. DDT, chlordane, and toxaphene have been recommended for controlling several alfalfa pests, but crops treated with these insecticides should not be fed to dairy animals, animals being finished for slaughter, or poultry.

when 0, 1, 2, and 4 pounds of DDT were applied per acre.

There were no significant differences in rate of gain in body weight, total gain, or feed consumption of the lambs.

The average amount of DDT present in the mesenteric and kidney fat was

1.9, 15.8, 18.2 and 44.2 ppm in the lambs consuming alfalfa hay dusted with 0, 1, 2, and 4 pounds of DDT, 19.6, 32.1 and 73.4 ppm in the fat of lambs receiving capsules containing 0, 50, 100, and 22 ppm DDT, respectively.

The average amount of DDT in muscle, liver, kidney and brain varied from 0 to 1.7 ppm.

There were no gross or histopathological changes in liver, gall bladder, kidney, brain, hind and fore leg muscle, or thyroid of the DDT-treated animals.

Digestion and Metabolism Trial on Field-Treated Hay

Four wethers were used to determine the digestibility of protein, ether extract, crude fiber, and nitrogen free extract of the DDT field-treated alfalfa hay described above. In addition, the total digestible nutrients and metabolizable energy content were determined. The alfalfa hay diet of these sheep was not supplemented with grain.

There were no apparent differences among the alfalfa hays in digestibility of protein, ether extract, crude fiber, and nitrogen-free extract or in the amount of total digestible nutrients. The DDT-dusted alfalfa hays had an increased metabolizable energy content when compared to the non-dusted alfalfa hay.

The DDT on the hay prevented the lambs from storing a maximum amount of protein in their tissues.



Alfalfa from DDT dusted plots (right) and from plots not dusted with DDT (left). Note the damage to the plant by the alfalfa weevil larvae in the latter

The lambs used in this study were fed in individual pens so that individual records on feed consumption could be kept

Effect of Feeding Lamb Tissues to Rats

Weanling rats were fed diets containing 22 percent lamb fat and 65 percent lamb leg from the lambs described above. One rat was fed the fat from each lamb, making eight replications of rats as far as DDT level was concerned, and a total of 64 rats in all. The period of feeding was 16 weeks.

The rats gained at a normal rate and showed no gross pathology or microscopic changes in liver or kidney. The amount of DDT in the fat of the rats fed lamb fat (lambs consumed DDT-dusted alfalfa hay) varied from 14 to 95 ppm, and in rats fed lamb leg the amount of DDT varied from 55 to 101 ppm. In those rats fed lamb fat from lambs receiving DDT in capsules, the amount of DDT varied from 10 to 100 ppm, and in those fed lamb leg from capsule fed lambs the amount of DDT varied from 38 to 144 ppm.

Dairy Cattle

DDT in Milk and Tissues of Dairy Cows Fed DDT-Dusted Alfalfa Hay

Sixteen dairy cows were fed hay dusted with 0, 0.5, 1, 2, and 4 pounds of technical DDT per acre for periods of 81 and 113 days. The DDT residue of the hay varied from 0 to 36 ppm.

DDT appeared in the milk promptly after the cows consumed DDT-dusted hay. The concentration gradually increased until maximum amounts of 0.0, 2.2, 3.8, 7.2, and 12.5 ppm of DDT were obtained in the milk of cows consuming hay dusted with 0, 0.5, 1, 2, and 4 pounds of DDT per acre, respectively.

DDT persisted in the milk at low levels (less than 1 ppm) for four months after the feeding of the DDT-dusted hay was discontinued. It disappeared completely by 6.5 months after discontinuing the feeding of dusted hay. Four cows had DDT in their milk at the end of their lactation period, and, after calving, traces of DDT were still present in their milk.

No DDT was found in the blood of the cows before they were placed on the DDT-dusted hay. A maximum of 0.2 ppm DDT was present in the blood at the close of the feeding period.

Four cows were slaughtered and the tissues were analyzed for DDT. The analysis showed a maximum of 89 ppm in mesenteric fat, 90 ppm in kidney fat, 1.1 ppm in the liver, 1.3 ppm in the muscle, and 0.1 ppm in the kidney. The greatest amount of DDT was present in the tissues of cows consuming the hay dusted with the higher levels of DDT.

The ingested DDT did not affect milk or butterfat production or feed consumption of the cows.

There was no gross or microscopic pathology in the liver or kidney of the cows after consuming the DDT-dusted hay.

Feeding Butter Containing DDT to Rats

Cream from each cow was churned and the butter was fed to rats for 16 weeks. The butter made up 22 percent of the diet and contained 0, 13, 42, 70, and 123 ppm DDT. On a dry basis the rat diets contained 0, 3, 10, 17, and 30 ppm DDT.

The fat of the rats contained 12, 46, 69, 107, and 188 ppm DDT, respectively, at the end of the feeding period. The rats gained normally in body weight and showed no gross pathology or microscopic changes in liver or kidney.

Effect of DDT upon the Digestation and Utilization of Certain Nutrients by Dairy Calves

Digestion and balance trials were conducted with 16 Holstein bull calves. Each calf was fed one level of DDT and four levels of protein equivalent. The DDT levels were 0, 25, 50, and 100 ppm of the diet and the protein equivalent levels were 10.2, 12.4, 14.5, and 16.5 percent in the dry diet, respectively.

Symptoms consisting of skin wrinkling, thickening of the skin, profuse scaling, thinning of the hair, lacrimation from the eyes, watery discharges from the nose, and tremors were noticed. These symptoms were more pronounced in the calves fed the highest levels of DDT.

As the DDT in the diet increased the amount of nitrogen stored decreased. The calcium and phosphorus balances were not affected by any treatment. DDT did not affect the digestibility of organic matter, crude protein, ether extract, cellulose, lignin, crude fiber, and other carbohydrates. The addition of urea to the diet improved the digestibility of crude fiber and cellulose, but did not affect the digestibility of the other nutrients.

Swine

Effect of Feeding DDT-dusted Alfalfa Hay to Swine and of Feeding the Swine Tissue to Rats

Twenty-four male and 24 female weanling pigs were fed undusted and DDT-dusted hay in their diets at the fol-

lowing percentage levels: 0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, and 33. The alfalfa was dusted in the field at the rate of 2 pounds of technical DDT per acre, and the hay had a residue of 23 ppm DDT. The pigs were fed until they reached market weight (approximately 210 pounds). There was no effect of the DDT on body weight gain, and there was no gross pathology or microscopic changes of liver or kidney of the pigs.

Rats were fed raw fat, cured bacon, and cured shoulder from the pigs for 14 weeks. There was no significant effect of the DDT on gain in body weight or food consumption, and there was no gross pathology or microscopic changes in liver or kidney of the rats. The amount of DDT in the swine fat varied from 0 to 15.3 ppm, in the shoulder from 0.3 to 9.4 ppm, and in the bacon from 0.3 to 11.2 ppm. The amount of DDT found in the body fat of the rats varied from 7.4 to 32.1 ppm after consuming diets containing swine fat, from 6.0 to 35.9 ppm after consuming swine shoulder, and from 9.4 to 28.8 ppm after consuming swine bacon.

Chickens

Feeding DDT-dusted Alfalfa Hay to Laying Hens

Laying hens were fed mash containing 15 percent of alfalfa meal. The alfalfa used in making this meal was the same as that used in the sheep experiments (dusted with 0, 1, 2, and 4 pounds of DDT per acre). DDT was also added to a mash containing undusted alfalfa meal at levels of 0, 50, 100, and 200 ppm DDT. The hens were fed 50 percent of the above mash and 50 percent of a grain mixture.

The average DDT content of the eggs was 2.5, 2.8, and 6.4 ppm when the hay had been dusted with 1, 2, and 4 pounds of DDT per acre, respectively. The body fat of the hens contained 52, 59, and 110 ppm, respectively, for these treatments, all determinations being made after 17 months of production on the experimental feeds.

When 50, 100, and 200 ppm of DDT was added to the mash, the average DDT content of the eggs was 17.7, 33.9, and 46.0 ppm, respectively, for all eggs produced during seventeen months of production. When these hens were sacrificed after 27 months of production, the DDT content of the body fat was 340, 456, and 2148 ppm for the 50, 100, 200 ppm DDT treatments.

Practically all of the DDT is contained in the yolk, relatively little being present in the white.

Egg production and mortality of the hens were not influenced by the DDT during 27 months of feeding the experimental diets.

Turkeys

Feeding DDT to Chicks and Turkey Poult

Chicks fed DDT-dusted alfalfa hay (treated with 0, 1, 2, and 4 pounds DDT per acre) gained weight normally, consumed the same amount of feed as normals, and had the same mortality rate as normals. Adding 50, 100, and 200 ppm DDT to the mash had no influence on feed consumption or weight gain, but there was a slightly increased mortality at the 200 ppm level.

In turkey poult fed the same levels of DDT-dusted alfalfa hay and DDT in the mash, grains in body weight and feed consumption were not influenced, but mortality was 31.5 percent at the 100 ppm DDT level, and 100 percent at the 200 ppm DDT level. In the latter group there were neuro-muscular symptoms characteristic of DDT poisoning. In poult fed the DDT-dusted alfalfa hay, mortality was not different from that of poult fed undusted hay.

Methoxychlor

Feeding Methoxychlor Dusted Hay to Dairy Cows

Alfalfa was dusted with 0, 1, 2, and 3 pounds of methoxychlor per acre, and the harvested hay was fed to 8 dairy cows for 113 days. No methoxychlor was found in the blood or milk of any of the cows at any time or in the fatty or other tissues at the end of the feeding period.

There was no effect of the methoxychlor on milk or butterfat production or on feed consumption of the cows.

Toxaphene

Toxaphene in Milk of Dairy Cows Fed Toxaphene-treated Alfalfa Hay

Alfalfa that had been treated with 1, 2, and 4 pounds of toxaphene per acre was harvested and fed to Holstein dairy cows for a period of 112 days. Two cows received untreated hay, and two cows received hay from each of the three toxaphene treatments.

No toxaphene was found in the milk of the cows receiving untreated hay, but it was found in the milk of cows

receiving treated hays, the amounts being 2.5, and 2.3 ppm, 4.3 and 3.9 ppm, 18.2 and 8.3 ppm for the 1, 2, and 4 pounds per acre treatments, respectively.

The toxaphene residue on the hays ranged from 49.4 to 81.3 ppm for the 1 pound per acre treatment, from 110.6 to 161.6 ppm for the 2 pound per acre treatment, and from 226.6 to 409.8 ppm for the 4 pounds per acre treatment.

There was no influence attributable to the ingested toxaphene on hay and grain consumption or on milk and butterfat production of the cows.

Three cows (one control, one that received hay from the 2 pound treat-

ment, and one that received hay from the 4 pound treatment) were slaughtered at the end of the feeding period and liver, kidney, muscle, and kidney fat were analyzed for toxaphene. Kidney fat from the cows receiving hay treated with 2 and 4 pounds of toxaphene was the only tissue from any of the cows that contained any toxaphene, the amount being 88 and 197 ppm, respectively. Examination of histological sections of liver and kidney of the slaughtered animals showed no changes that could be attributed to the toxaphene.

The alfalfa plots treated with 2 and 4 pounds of toxaphene per acre showed good economic control of alfalfa weevil larvae.

Chlordane and Aldrin

Feeding Chlordane-and-Aldrin-Treated Alfalfa Hay to Dairy Cows

Alfalfa hay was treated with 0, 1/2, and 1 pounds of chlordane per acre and 0, 2, and 4 ounces of aldrin per acre. After harvest and storage for about six months, the hay was fed to dairy cows, two on each separate lot of hay.

Residue of chlordane on the hay at the time of feeding averaged 0, 9.5, and 15.3 ppm, respectively, for the three treatments while aldrin residues were 0, 0.14, and 0.35 ppm for the three treatments, respectively.

No chlordane or aldrin was found in the milk of any of the cows. Milk yield, hay consumption, and body weight did not appear to be influenced by insecticide treatment.

One cow on each of the heavily-treated hay lots was slaughtered and tissue examined. Histological examinations of kidney, liver, and muscle did not show any tissue damage attributable to insecticide ingestion. Body fat, liver, kidney, and muscle tissue from both cows are to be analyzed for insecticide content.

Five cows were fed aldrin in corn oil at levels of 0.5, 0.5, 1.0, 1.0 and 1.0 milligrams per kilograms body weight for two weeks. Although this was 10 times the amount ingested by cows consuming the hay treated with 4 ounces per acre, no aldrin was detected in the milk. Similar work at USDA indicates that aldrin can be detected in milk when cows ingest 8.0 milligrams per kilogram body weight or higher doses. They also indicate higher residues on hay than observed on this experiment but they did not observe any transmission of aldrin to the milk in any of their trials.

NEW PUBLICATIONS

Bul. 366. The relation between gradings of live and dressed chickens in Utah, by Roice H. Anderson and Glen E. Downs. Department of Agricultural Economics in cooperation with the eleven Western States and the U. S. Department of Agriculture. A Western Regional Publication. 16 p.

This bulletin discusses the present method of buying fryers on a basis of buyers' live grades. It points out that the variation between live and dressed grade-out does not assure equality among producers. The authors conclude that the practice of selling chickens on a flock-run basis may be as equitable for growers as selling on buyers' grades and would permit competition among buyers to be registered through paying price rather than grade-out.

Bul. 367. Hybrid corn tests in Utah, by R. W. Woodward and R. F. Nielson. Department of Agronomy in cooperation with the U. S. Department of Agriculture. 18 p.

This bulletin lists the corn hybrids that have given the highest silage yields in trials throughout the state.

Bul. 368. The drainage problem in the Cache Valley lowlands, by Willard Gardner and O. W. Israelsen. Departments of Physics and Irrigation and Drainage. 13 p.

Need for and methods of draining low lying valley lands are discussed in this publication.

Cir. 134. Seasonal variation in production and price as it affects returns from egg production, by Ernest M. Morrison and Roice H. Anderson. Department of Agricultural Economics.

This circular points out that by raising December chicks, the producer can sell eggs when prices are highest and consequently his profits from the poultry enterprise will be greater under present conditions than when he starts his flocks in late spring.

A Simple Method to Determine Maturity and Quality in Lima Beans

D. K. SALUNKHE and L. H. POLLARD

A RELATION BETWEEN stage of maturity, yield, and quality of many vegetable crops is well known. That is, as maturity advances, yield increases, but quality sometimes decreases. Consideration needs to be given to all three factors in the production of vegetable crops used for processing. The consumer desires a product of high quality, whereas the grower is interested in the returns that he is able to get per acre. Consequently, the processor must know at what stage a crop may be processed satisfactorily and still give a good return to the grower.

There is no satisfactory method for determining the stage of maturity of raw lima beans. The determination of the percentage of white or mature beans has been a common method, but it is relative and generally of only limited value. The moisture as determined by the Steinlite Moisture Meter has also proved inadequate. The determination of the alcohol insoluble solids could no doubt be used, but this is a method requiring considerable time so it has little value for field determinations. There is, then, a definite need for a quick and yet accurate method to determine the quality of fresh lima beans prior to harvest.

The purpose of this paper is to present the results on the microscopic examinations of starch grains of two strains of lima beans at different maturities.

The lima beans were grown on a productive sandy loam soil at the Farmington Field Station. The two strains 873-2-1 and 836-6 were planted on June 3, 1953. The planting of each strain was divided into a number of plots for the purpose of harvesting at six stages of maturity. These plots were randomized within each of four replications. To obtain beans of different maturities, the following six harvest dates were established:

DR. D. K. SALUNKHE is a new member of the staff this year. He graduated from the University of Poona, Bombay, India, in 1949 and then obtained his M. S. and Ph.D degrees from Michigan State College. DR L. H. POLLARD is head of the Department of Horticulture.

- I maturity August 29.
- II maturity August 31.
- III maturity September 2.
- IV maturity September 4.
- V maturity September 7.
- VI maturity September 10.

After harvest, the pods were shelled and the beans were washed. Immediately following the washing, a slurry of each sample was prepared in 95 percent alcohol with the aid of a Waring blender. The microscopic examination was then made on the starch grains from each slurry after the addition of distilled water.

Starch Grains Examined

The slurry was shaken vigorously in an attempt to get a well-mixed sample of starch grains. A drop from each slurry was placed on a slide for microscopic examination of the starch grains.

It is apparent from fig. 1 that the hylum of the starch grain becomes larger and more ramified as maturity advances from I to VI. Perhaps this may be the result of varying degrees of dehydration of the starch grains. The pattern of microscopic observations of starch grains was identical in both strains of lima beans.

Method Is Simple Enough To Be Used By Fieldmen

This method is simple enough to be used by fieldmen of the canning companies. They could take random samples of pods from the various parts of the field. After shelling the pods, the beans are ground in a mortar with water and a drop of this diluted slurry is examined under a microscope. When the hylum of most of the starch grains begins to thicken along with its ramifications (stage III and IV in fig. 1), then it may be estimated that the field is ready to harvest without much loss of yield or quality.

Robert A. Norton joined the staff of the Department of Horticulture on February 1. Prof. Norton was born in Connecticut. He received his B.S. and M.S. degrees from Rutgers University, New Brunswick, New Jersey. He received his doctor of philosophy degree from Michigan State College at the commencement exercises this month. His thesis study was on the nutrition of the strawberry with particular reference to leaf absorption.

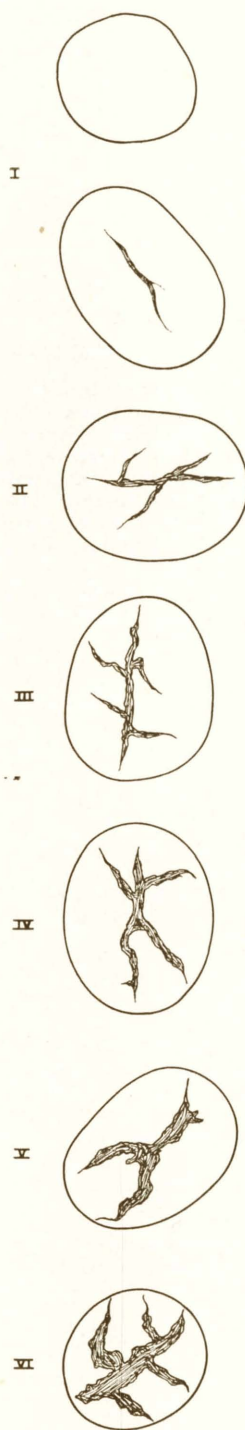


Fig. 1. Effect of maturity on the structural development of hylums in starch grains of lima beans.

Poor Breakfasts

(Continued from page 37)

be the result of differences in eating habits or to the fact that Wellsville children have farther to go to school and thus omit breakfast more often because of the time involved?

Comparing the total day's diet between the children of the two schools the Logan children were consuming significantly more protein, calcium, phosphorus, vitamin A, and niacin than were the Wellsville children, but there was no significant difference for any one nutrient for the total day's diet between the children who received a school lunch and those who did not. This may be related to the percentage of children missing their breakfasts because the Wellsville girls had the most deficient diets of any group and they were also the group who missed the most breakfasts.

The intake of the principal foods appearing in the breakfast menus for the various groups of children in terms of average number of servings weekly is shown in table 1.

Not Enough Milk Used

It is important that children receive at least eight ounces of milk each day for their breakfast if they are to obtain an adequate milk intake for the day of 3 to 4 cups as recommended. Only two groups attained this standard, the boys of Logan who received school lunch and the boys of Wellsville who did not receive school lunch, 9 cups per week for each group, including both milk and cocoa. All other groups fell short of 7 cups per week, or this standard. As can be observed from table 1 only a small percentage of cocoa was used by the children as compared to milk.

Boys on the average had more milk during the week than did the girls. Milk was the food which contributed more to protein for breakfast than any other food for the week. Only 5 children out of the entire group had no milk for breakfast. Wellsville girls had the lowest average intake of milk per week for breakfast, probably because there was a larger percentage of children missing breakfast in those groups.

Eggs Most Popular Form of Protein Eaten

Eggs were the most popular of the protein main dishes for breakfast. The average number of weekly servings for the various groups ranged from 2 to 5. Eggs were used in larger amounts by the boys (4 to 5) than by the girls (2 to 3)

Table 1. Average number of servings per week for each age group for breakfast

| Food | Serving | Group | Average serving for girls | | Average serving for boys | |
|--------------------------|-----------------|------------|---------------------------|---------|--------------------------|---------|
| | | | S.L.* | N.S.L.† | S.L.* | N.S.L.† |
| Milk | cup | Logan | 4.8 | 4.8 | 8.4 | 6.0 |
| | | Wellsville | 3.3 | 2.7 | 5.6 | 7.8 |
| Cocoa | cup | Logan | 0.8 | 1.2 | 0.3 | 0.4 |
| | | Wellsville | 0.4 | 1.4 | 1.0 | 0.8 |
| Eggs | one | Logan | 2.9 | 2.6 | 4.3 | 3.5 |
| | | Wellsville | 1.9 | 2.0 | 5.1 | 3.5 |
| Bacon | 2 slices | Logan | 0.2 | 0.8 | 1.2 | 0.9 |
| | | Wellsville | 0.5 | 0.8 | 1.4 | 0.8 |
| Ham, sausage | 2 oz. | Logan | 0.3 | 0.3 | 0.4 | 0.3 |
| | | Wellsville | 0.1 | 0.2 | 0.4 | 0.4 |
| Cereals | ½ cup | Logan | 2.9 | 3.6 | 6.2 | 7.4 |
| | | Wellsville | 2.3 | 2.6 | 9.3 | 12.6 |
| Sweet rolls | Average | Logan | 0.3 | 0.0 | 1.2 | 0.4 |
| | | Wellsville | 0.3 | 0.5 | 0.1 | 0.2 |
| Bread | 1 slice | Logan | 4.5 | 6.5 | 5.7 | 8.4 |
| | | Wellsville | 5.0 | 6.6 | 8.9 | 8.8 |
| Hot cakes, waffles | Medium | Logan | 1.8 | 1.1 | 4.6 | 3.5 |
| | | Wellsville | 2.9 | 1.7 | 2.9 | 3.6 |
| Citrus fruit or tomatoes | 1 med. or ½ cup | Logan | 4.6 | 3.8 | 4.5 | 3.5 |
| | | Wellsville | 2.5 | 2.3 | 2.2 | 3.8 |
| Other fruits | 1 med. or ½ cup | Logan | 2.0 | 1.9 | 1.9 | 3.4 |
| | | Wellsville | 0.6 | 1.8 | 1.3 | 3.0 |

*S. L.—School lunch

†N. S. L.—No school lunch

in both schools. Less than 11 percent of the children had one egg or more for breakfast daily; approximately 29 percent had an egg every other day; and at least 17 percent did not have an egg for breakfast on any one of the 7 days.

Forty-one percent of the children had bacon for breakfast once during the week. Less than 19 percent of the children had a serving or more of meat, such as ham, sausage, or pork during the week.

Bread Food Most Often Eaten

On the average the boys ate 6 to 13 servings of cereals per week as compared to the girls eating only 2 to 4 servings. About 14 percent of the children had no cereal for breakfast during the week of this study. Whole wheat cereals were eaten more often than refined cereals.

Bread in some form was the food most often eaten for breakfast. The largest majority of boys had at least one slice for breakfast. Only 37 percent of the girls had one slice or more of bread each day for breakfast. White bread was eaten almost twice as often as whole wheat bread. Since the white bread was enriched, the children still received a substantial amount of their B vitamins and iron from the white bread as well as the whole wheat bread.

Waffles and hot cakes were eaten for breakfast by approximately 50 percent of the children, while sweet rolls were eaten

only by 17 percent. These baked products were not used regularly each day during the week. Girls ate 1 to 3 hot cakes per week, while the boys ate 3 to 5.

Not Enough Fruit Served

The average intake of citrus fruits and tomatoes varied from 2 to 5 servings per week. There was little difference in the average servings between the boys and the girls. Less than 12 percent had a serving of this type of fruit daily for breakfast, whereas 27 percent had none. Thirty-two percent had one serving at least 3 times a week. The other fruits were eaten less frequently than the citrus fruits or tomatoes. Fruits could have been used more liberally in the children's diets.

Many Children Had Poor Breakfasts

The breakfasts of the children were classified as poor, fair, or good. A good breakfast should contain milk, vitamin C-rich foods as citrus fruits or tomato juice, egg or any other protein-rich food, and cereal, or bread. If these foods are included in each breakfast meal, they usually meet a fourth to a third of all nutrients as recommended by the National Research Council.

The percentage distribution of the various groups of children according to the classification of their breakfasts as observed in the seven-day records is shown

in fig. 2. A larger percentage of Logan school children had good breakfasts than Wellsville children, ranging from 11 to 70 and 4 to 50 percent, respectively. More of the girls than the boys had poor breakfasts. Poor breakfasts were most frequent among the Wellsville girls.

An educational program for the improvement of breakfasts, not only for girls, but for boys as well would be desirable. The percentage of children receiving poor breakfasts in all groups indicates the need of more emphasis on the improvement of the breakfast meal.

As shown by various other studies as well as this one, good breakfasts seem to fortify children against poor daily diets. Poor breakfasts remain uncompensated throughout the day. As stated by some authorities only one of five children with poor breakfasts makes up the deficit in the other two meals of the day.

Phosphate Supplements

(Continued from page 36)

plied. Phosphorus supplements, on the other hand, are not palatable and are more expensive.

A lack of sufficient phosphorus in the diet of a high producing cow may cause her to have a depraved appetite and cause a drop in milk production. When the amount of phosphorus in the diet is low, the digestibility of the feed is not seriously reduced, but the digested nutrients are utilized inefficiently. Costs of production rise proportionately.

Two high producing cows at the Dairy Experimental Farm showed evidence of a phosphorus deficiency even when steamed bone meal was fed free choice and as 1 percent of the grain ration. These cows apparently did not consume sufficient steamed bone meal to meet their phosphorus requirements. A study was made to determine means by which cows might be induced to consume additional phosphorus and prevent such deficiencies.

Steamed bone meal was used as a source of phosphorus in these trials although any good defluorinated phosphate could have been used. Since salt is quite palatable, it was felt that its combination with a phosphorus supplement would be more acceptable than the supplement alone. The salt used was a good grade of iodized stock salt.

Bone Meal Unpalatable

In a preliminary trial of 53 days, from January 12 to March 8, 1952, approximately 20 cows were given a grain ration containing 1 percent each of salt and steamed bone meal. They were also

Table 1. Amounts of steamed bone meal and salt consumed during feeding trial January 12 to March 8, 1952

| Steamed bone meal (percent) | 100 | 75 | 50 | 25 |
|----------------------------------|---------------|---------------|---------------|---------------|
| Salt (percent) | 0 | 25 | 50 | 75 |
| | <i>pounds</i> | <i>pounds</i> | <i>pounds</i> | <i>pounds</i> |
| Total offered | 40 | 40 | 40 | 56 |
| Total weighed back | 37.6 | 35.9 | 24.6 | 24.7 |
| Total consumed | 2.4 | 4.1 | 15.4 | 31.3 |
| Steamed bone meal consumed | 2.4 | 3.1 | 7.7 | 7.8 |
| Salt consumed | 0 | 1.0 | 7.7 | 23.5 |

Table 2. Amounts of steamed bone meal and salt consumed during feeding trial January 1 to April 20, 1953

| Steamed bone meal (percent) | 100 | 66 $\frac{2}{3}$ | 33 $\frac{1}{3}$ | 0 |
|----------------------------------|---------------|------------------|------------------|---------------|
| Salt (percent) | 0 | 33 $\frac{1}{3}$ | 66 $\frac{2}{3}$ | 100 |
| | <i>pounds</i> | <i>pounds</i> | <i>pounds</i> | <i>pounds</i> |
| Total offered | 120 | 120 | 120 | 285 |
| Total weighed back | 119.8 | 117.4 | 109.9 | 88 |
| Total consumed | 0.2 | 2.6 | 10.1 | 197 |
| Steamed bone meal consumed | 0.2 | 1.7 | 3.4 | 0 |
| Salt consumed | 0 | 0.9 | 6.7 | 197 |

fed a high quality alfalfa hay free choice, and corn silage. The cows had free access to two mineral boxes in the corral, each of which was divided into four compartments.

One of these compartments contained 100 percent steamed bone meal while the other contained mixtures of salt and steamed bone meal as follows: 75 percent steamed bone meal and 25 percent salt; 50 percent steamed bone meal and 50 percent salt; and 25 percent steamed bone meal and 75 percent salt. The minerals were weighed into the different compartments at two-week intervals and those not consumed during this period were weighed and recorded. At each change, the minerals were rotated clockwise to a different compartment in the box to make certain that differences in consumption were not associated with a more accessible compartment.

Results of the experiment are given in table 1. Steamed bone meal consumption of mixtures containing 50 and 75 percent salt was two to three times as great as of mixtures containing less salt. There was little or no difference in steamed bone meal consumed from mixtures containing 50 and 75 percent salt.

Salt Improves Palatability

A second feeding trial was conducted during the period of January 1 to April 20, 1953, totaling 104 days. An average of 22 cows was used on the trial. The procedure was the same as for the prior trial, except that the minerals were weighed back and fresh minerals fed once a week, as it had been observed that the cows did not care for steamed bone meal or the mixtures in which it

was included after they had been in the mineral box for a period of approximately two weeks.

Salt without added steamed bone meal was included in the trial along with mixtures as follows: 100 percent steamed bone meal; 66 $\frac{2}{3}$ percent steamed bone meal, and 33 $\frac{1}{3}$ percent salt; 33 $\frac{1}{3}$ percent steamed bone meal and 66 $\frac{2}{3}$ percent salt; and 100 percent salt.

The results are summarized in table 2. The cows preferred mixtures with a higher salt content and consumed practically no straight steamed bone meal.

The cows consumed eight times as much steamed bone meal when they had access only to mixtures of salt and steamed bone meal. When allowed access to salt without added steamed bone meal, they consumed an average of only one gram of steamed bone meal per cow per day from the other mineral mixtures.

Dry Cows and Heifers Need Phosphorus

Although the dry cows and the young stock on the farm were not included in the experiment, it was observed that they readily ate a mixture of 50 percent steamed bone meal and 50 percent salt when it was offered to them. The young heifers would consume about half a pound weekly of the mixture if it was kept fresh, but rarely touched it if it was allowed to remain in the mineral box for a period of two weeks or more.

While the milking herd was on pasture, during the summer of 1953, they had access to a mineral box containing a 50-pound block of iodized salt and a mixture of 50 percent steamed bone meal and 50 percent salt. They consumed 105 $\frac{1}{2}$ pounds of the mixture and only 17 $\frac{1}{2}$ pounds of the block salt.

Farm Prices

(Continued from page 27)

time they were below the prices of all commodities, and substantially below for a considerable period of time. Only for about one year, 1951, were wool prices above all prices by an appreciable amount. At last reports the difference was not large.

Butterfat, Eggs, and Turkeys

In comparison with the prices of meat animals (fig. 1) the prices of butterfat, eggs, and turkeys have four characteristics that stand out (fig. 2). The first is that none of these prices went anywhere near the heights reached by the prices of meat animals. The second is that the peak levels were reached prior to the 1949-50 recession. After the outbreak of Korean hostilities the average of all commodities and meat animals all rose to record heights. Butterfat, eggs, and turkeys did not. The third is that these products declined much more during the interval 1948 and 1951 than the average of all commodities. The fourth is that the prices were more erratic within a short time. These characteristics probably stem from the greater seasonality of production, perishability, and ease of increasing and retarding production.

Butterfat prices as used in fig. 2 include only the butterfat used in processing. Milk used for fluid consumption is not included. Were the fluid milk included, butterfat would no doubt appear more favorable. Detailed data are not available for grade A milk back to 1935. Available information indicates that during 1937-39 the price of butterfat in market milk was less than 20 percent more than butterfat used for processing. During recent years the difference has exceeded 80 percent at some times. An increasing proportion of total milk is paid for as grade A.

Eggs have occupied a middle course between butterfat and turkeys most of the past several years. Turkey prices have been above the 1945 level of approximately 200 for short periods of time. In 1950 they were barely above 100. Latest reports show turkey prices considerably below the average of all commodities.

Of these three products butterfat prices have been relatively the highest. From 1943 to 1949 butterfat prices were substantially above the prices of all commodities most of the time. Since 1949 they have been, generally, slightly below all commodities. At latest reports there

was little difference. Egg and turkey prices have been below all prices most of the time. Sometimes the difference was slight, other times, particularly during the past five years, it has been considerable, particularly for turkeys.

It should be emphasized that prices alone do not determine profits. Although the prices of these products have been relatively less favorable than prices of all commodities, this need not mean these enterprises have been less profitable. Greater production per unit, less death loss, reduced labor requirements, relatively lower feed costs, and other efficiencies could result in equal or even greater profits.

Feed Crops

The prices received for feed crops have followed quite closely the average of all commodity prices. Fluctuations have been greater but have been both above and below the average. Since 1943 hay prices have been higher than the average of all commodities most of the time. Barley prices have generally been below the average and from 1948 to 1952 showed the most important deviations. The largest deviation was in hay prices during 1952. The extremely severe winter of 1951-52, combined with the relatively short crop of 1951, sent hay prices to high levels—even higher than for beef cattle. This was, however, for less than a year's time.

A comparison of the relative prices of feed crops to the prices of beef cattle helps to explain the large increase in cattle numbers during the past several years. Comparisons for feed with butterfat, eggs, and turkeys are needed to understand the economic position of those enterprises.

Contract Crops

The prices of contract crops have generally been less favorable than the average of all farm commodities. In no year since 1940, did the prices of canning peas equal the average prices for all commodities (fig. 4). The index reached a maximum of 187 in 1951. Sugar beets and canning tomatoes have been below the all commodity index continuously since 1947. Tomato prices were relatively favorable from 1942-47. Sugar beets were relatively most favorable during 1940-42.

Exact prices for 1954 contract crops will not be available until after the harvest. This is because the quality of product and sales prices for sugar influence

the final prices paid. Estimates based on the contracts indicate that at the present time peas are still relatively low.

Present Level of Prices

The discussion up to now has dealt with the changes in prices since 1940. The level of prices for March 15, the latest data available, is shown in fig. 5. The prices for every commodity are above the 1935-39 level. The amount of increase differs greatly. Hogs were highest, 295 percent, and potatoes were lowest, 119 percent of the base period. Farm costs (for the United States since complete data are not available for Utah) were 226 percent. The prices of about a third of the commodities were relatively higher than costs. This means that they would be above parity on the 1935-39 basis. (This is not the base for official parity calculation.) About two-thirds of the commodities were below parity.

Sprinkler Irrigation

(Continued from page 33)

hours per acre-inch of water applied were required on these systems, with an average of 1.5 man-hours per acre-inch. Most of the systems studied were on large farms where an irrigation crew worked most of the time moving and setting the irrigation pipe. This is in contrast with the situation in Utah where the irrigation is often performed as a minor secondary task, with systems being designed so that they will operate from 4 to 24 hours per setting.

Rather meager studies have been reported in Montana, Oregon, and Idaho. The Montana results indicate a labor requirement of 0.75 man-hours per acre-inch when hay or grain was irrigated and 1.1 man-hours per acre-inch for new crops. The Oregon report simply gives an average of 0.59 man-hours per acre-inch of water applied, indicating also an average time per setting of 7.5 hours. The Idaho results showed a range of 0.3 to 1.8 man-hours per acre which, if a three inch irrigation is assumed, would give a range of 0.1 to 0.6 man-hours per acre-inch. These figures are comparable to the preliminary results obtained in Utah in 1953.

Evaluation of Sprinkler Effectiveness

A rather important advantage of sprinkler irrigation systems over some other types of irrigation systems is that water can be carefully controlled and applied in small quantities when the need arises. In considering the effective-

ness of a given sprinkler irrigation system, the farmer should keep in mind that sprinkler nozzles are available in a wide range of sizes, varying from one which will discharge only a few gallons per minute and cover a rather small area of land to one which discharges more than 1,000 gallons per minute and may cover an area of two or three acres from each nozzle. It can be readily seen that a multitude of different combinations of rate of application and area covered are available for the design of a sprinkler irrigation system.

If the soil is relatively impermeable then the system must be designed with nozzles which apply water at a relatively low rate. Under these conditions, of course, evaporation losses during the application of the water will be relatively high. If the soil is quite open and pervious then the water can be applied at a much higher rate and this will tend to reduce evaporation to a rather negligible quantity if the time of application during the day is carefully chosen.

Wind conditions affect not only the evaporation but also the uniformity of distribution of water over the area being sprinkled. In the studies made in 1953, it was found that when one system was operated during the early morning hours, from 6 to 10 a.m., the overall water losses from evaporation and wind drift amounted to 10 percent of the water applied. The same system, operated under a slightly lower pressure between the hours of 11 a.m. and 2 p.m. showed losses of 40 percent of the water applied. Information was not available during the 1953 studies on the amount of wind or relative humidity at the field which, of course, may have had an abnormal influence on the amount of water losses by evaporation. It is planned during the coming season to obtain measurements of wind and humidity in order that their effects might be evaluated.

Irrigation Schedules

Some troubles arise in the use of sprinkler systems in Utah because the farmer is forced to schedule his irrigations in exactly the same manner that he has been accustomed to doing under surface irrigation methods. Particularly is this the case where the irrigation water is provided on a rotation system of distribution. The problems of designing a sprinkler irrigation system to meet these conditions are large. The system operated under these conditions

usually does not obtain the optimum efficiency and, in addition, the labor and equipment costs are usually higher than would be necessary under a more flexible distribution method.

From an economic standpoint, a sprinkler system which is only used for one or two days out of every two weeks has little opportunity to give much of a return on the investment. When systems must be designed to meet this kind of a schedule, a rather large pump and power unit are required and usually also more pipe than would be necessary

if the system could be operated at least 50 percent of the time during the irrigation season.

The study of existing sprinkler irrigation systems in Utah will be expanded considerably during the 1954 season to include many more systems and also to obtain additional information to evaluate the effectiveness of the systems. These studies, when completed, will enable the Experiment Station to give the farmer much more reliable advice on the use of sprinkler irrigation systems than is possible at the present time.

Dry Farming Methods

(Continued from page 31)

about as well in 30 inch rows as in 48 inch rows, however. Nitrogen fertilizer stimulated vegetative growth but had little effect on seed yields. A residual effect from nitrogen applied in previous years was noted on vegetative growth. Results show that there are possibilities in growing wheatgrasses for seed on dry land. On the other hand there are hazards—seed prices are not stabilized, seed quality is frequently low, and yields may not be profitable if soil moisture is deficient.

Time of Plowing Fallow Land

Varying fall plowing dates had no effect on wheat yield. There was no difference in the yields obtained from fall plowing and spring plowing early or spring plowing two weeks later. Further delay in spring plowing reduced wheat yields drastically.

Depth of Plowing Fallow Land

Wheat yields were 8 percent higher when land was plowed eight inches deep than when it was plowed five inches deep. There was little difference between the yields from eight inch and ten inch plowing. Subsoiling 15 and 18 inches deep did not increase yields. If maximum returns are to be obtained and if costs are to be kept down, plowing should not be shallower than 5 inches nor deeper than 8 inches.

Type of Tillage Implement

The moldboard plow gave significantly higher yields than the oneway disk and the disk harrow. However, the results probably reflect differences in depth of tillage as well as in type of implement. Relative crop yields are not fully adequate as a measure of the worth of a tillage implement. Erosion control

and crop quality are also important. The goals of tillage can usually be attained better by using a number of implements rather than just one.

Frequency of Cultivation of Fallow

Cultivation of fallow more than was necessary to control weeds did not increase yields.

Green Manure

Peas plowed under when 6 and 12 inches high increased wheat yields slightly. When more mature than this peas reduced wheat yields. Wheat plowed under at similar stages of growth reduced wheat yields more than did peas. Evidence was found that the reduction in yield probably resulted from a temporary deficiency of nitrate nitrogen and that soil fertility on the green manured plots had actually been increased.

Commercial Fertilizer

Wheat yield and protein content were increased by nitrogen fertilization. Forty pounds nitrogen per acre showed more benefit than 20 pounds. The nitrate form of nitrogen was more effective than the ammonia form when comparable rates were used. No significant difference was found between fall and spring applications. Nitrogen fertilizer did not take the place of the fallow in the 1952 trials. Results suggest it would be good procedure to wait until early spring before applying nitrogen fertilizer. If at that time there is evidence of poor fall emergence, winter injury, drought, or other unfavorable conditions, the fertilizer could be saved for a more propitious year. Evidence was found that small applications of nitrogen can counteract the reduction in yield often noted when a stubble mulch is used. Results from

the use of urea spray were not encouraging. The same rates of nitrogen applied to the soil in early spring in the form of ammonium sulfate increased yield and protein content much more. If moisture is low, response to nitrogen fertilizer may not be favorable.

Farm Manure

Manure increased the yield of winter wheat no matter what the rate or time of application used. Ten tons manure applied every two years or every four years increased wheat yield approximately 20 percent over the unmanured. Where manure was applied only once (1915) a residual beneficial effect on yield was noted up to about the sixteenth year (1930). In wetter years manure benefited wheat yields more than in drier years.

Stubble Disposal

Burning the straw increased wheat yield for many years, then gradually decreased it. Over a period of 37 years burning increased yield about 2 percent as compared with plowing all the straw under. However, for the last 7 years of the period there was a 0.5 percent decrease in yield from burning. Plowing under straw probably lowered the content of available nitrogen in the soil and wheat growth was retarded. The loss of organic matter and nitrogen from burning the straw may now be depressing the yield more than enough to offset the greater availability of soil nitrates in the burned plots.

Cropping Experiments

The standard wheat-fallow cropping practice was compared with continuous cropping and with systems that permit one crop in two years and two crops in three years. Results show that under Nephi conditions the alternate wheat-fallow cropping system will give greater net returns than the others.

Rotations

Twenty-seven rotations were evaluated. Wheat was common to all. Under no other rotation were wheat yields as high as they were under the alternate wheat-fallow cropping system. When row crops were substituted for fallow, wheat yields were reduced 3½ bushels per acre. When alfalfa was included wheat yields were reduced 5½ bushels per acre. Nevertheless, it appears that alfalfa improved soil fertility; the yield reduction probably resulted from more complete

and deeper drying of the soil by alfalfa. Except for alfalfa, the crop immediately preceding wheat was the one that had the predominant influence on the yield of wheat. Wheat was the only crop distinctly benefited by the summer fallow.

Rate and Date of Seeding Winter Wheat

Yields gained consistently as seeding rate increased from 2 to around 6 pecks per acre. Above the latter rate yields remained about the same. Six pecks per acre gave the highest net yield. Seeding on October 1 gave the highest average yield. However, this was not greatly different from the average yields for September 15 and October 15 seedings.

Butter or Oleo?

(Continued from page 35)

oleo to butter sales in farm rather than non-farm areas in Utah. Many dairy farmers purchase their butter from the processing plant they sell milk to. Their purchases, therefore, do not ring through the grocery store cash register.

At the present time the U. S. butter hoard is about 300 billion pounds. In addition, millions of pounds of dried skim milk and cheese are held. More are being added to the stock pile each day. This year, at current rates of production and consumption, approximately 6 billion pounds more milk will be produced than consumed. This is 10 times the entire annual production of milk in Utah. If the dairy industry is to remain a strong, healthy farm enterprise, more milk and milk products will have to be consumed through normal trade channels rather than purchased by Uncle Sam. Increased grocery store butter sales will help correct the present unhealthy situation.

Soil Moisture Storage

Over the period of a wheat-fallow cycle only 32 percent of the rainfall was stored as soil moisture. The other 68 percent was lost mostly by runoff and evaporation. Summer rainfall was ineffective in building up soil moisture reserves. Delay in spring plowing reduced the amount of soil moisture accumulated.

Experimental results obtained at the Nephi Dry Land Experimental Farm over a fifty year period have made it possible to formulate sound recommendations for dry land agriculture throughout the Intermountain Area. Many of the practices now followed originated at the Nephi Station.

In an effort to stimulate sales, the support price (price which the government pays for its stockpile of farm products) on dairy products was lowered last April 1st from 90 to 75 percent of parity. This resulted in a reduction of 8¼ cents per pound for the support price of butter. Prior to April 1st butter was selling in the grocery store for about 76 cents per pound. At the present time the average price is 68 cents.

These 83 stores were surveyed the week of March 15-20 and again May 10-15. Prior to the drop in butter prices 3.7 pounds of oleo were sold to 1 of butter. After the 8 cent drop in price, the ratio decreased to 3.2 pounds of oleo to 1 of butter. This represents increased butter sales of nearly 14 percent. At the same time, oleo sales in these 83 stores declined about 2½ percent.

A total of 265 more pounds of table spread were sold in these 83 stores during the week of May 10-15 (after the drop in price) than in the week of March

(Continued on page 48)

CONTRIBUTIONS TO RESEARCH

February 15 to May 15, 1954

| | | |
|-----------------------------------|------|---------------------------|
| Funk Brothers Seed Company | \$80 | } for hybrid corn testing |
| Northrup King Company | \$80 | |
| DeKalb Seed Company | \$60 | |
| Steve Regan Company | \$60 | |
| Utah Cooperative Seed Association | \$60 | |
| Porter Walton Seed Company | \$40 | |
| Jacques Seed Company | \$20 | |
| Corneli Seed Company | \$10 | |
| Crorkhan Seed Company | \$10 | |
| | | |



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R. H. Walker

Director

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CONTRIBUTIONS TO RESEARCH

February 15 to May 15, 1954

| | |
|---|---|
| Utah County Commissioners | \$5000 to conduct research on drainage of water logged lands |
| Sugar Research Foundation | \$2500 for study of feeding sugar to livestock |
| Utah Idaho Sugar Company | \$2000 for irrigation and fertilizer studies on sugar beets |
| Shell Chemical Corporation | \$750 for insecticide investigations Dieldrin, aldrin, and lindane for insect control studies |
| Velsicol Company | \$600 for insecticide investigations |
| American Can Company | \$500 each for study of tomato quality |
| Utah Cannery Association | \$500 for study of chelating compounds |
| Geigy Agricultural Chemical Company | 2 tons treble superphosphate to be used in fertilizer trials throughout the state |
| Anaconda Copper Mining Company, Fertilizer division | 7 tons ammonium sulfate to be used in fertilizer trials throughout the state |
| Columbia-Geneva Division United States Steel Corporation | 30 gallons Chloro-IPC for weed control studies |
| California Spray-Chemical Corporation | 4 barrels trichlorobenzene for studies on control of water weeds |
| Columbia-Southern Chemical Corporation | Lindane for insect control studies |
| Ethyl Corporation | Areo-cyanamide for weed control in onions |
| American Cyanamid Company | Solium cynamide for weed control studies |
| Dow Chemical Company | 2,4-D and 2, 4, 5-T formulations for weed control studies |
| American Chemical Paint Company | Dalapon for control of grassy weeds |
| Charles Pfizer & Company, Inc. | 2,4-D formulations, Amizol and amino trazole for weed control studies |
| Associated Seed Growers, Inc. | Agrimycin-100 for experiments in controlling fire blight disease of apples and pears |
| | Assorted varieties of vegetable seeds |
| | 1460 pounds lima bean seed |

See page 47 for additional contributions

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15-20 (prior to the drop in butter prices).

Will the housewife continue to increase her purchases of butter and lower the oleo-butter ratio? Or was this slight increase in butter sales temporary and brought about largely through publicity about butter at the time of the parity price change? Time will tell. Many grocery store managers expressed an opinion that to move butter in substantial quantities would require a butter-oleo price differential of not more than 10 cents per pound. Such a differential would result in another price drop of about 20 cents or about $2\frac{1}{2}$ times the decrease occurring April 1st of this year. A price decline of this size would result in a further substantial decrease in income of dairy farmers.

Charles J. Sorenson

(Continued from page 29)

entomology, a position which he will hold until June 30.

During most of this period Professor Sorenson has taught some courses in addition to his experiment station work and he has also been engaged for various short periods in part time extension work. During recent years his teaching activities involved responsibility for a course in agricultural entomology and one in insect transmission of plant diseases. He has been major professor of 12 graduate students in entomology, Lowell Cutler, Farrell H. Gunnell, Edward W. Anthon, Heber Floyd Thornley, Lee R. Jeppsen, L. Floyd Clark, John M. Wright, Reed Roberts, Ted Tibbetts, Gordon A. Hobbs, B. Austin Haws, and Walter H. A. Wilde. Five of these have since obtained a Ph.D. degree in entomology or zoology. Many of these students assisted Professor Sorenson in his research work, and the five first mentioned have collaborated with him in publications.

Professor Sorenson is a member of Sigma Xi, Phi Kappa Phi, AAAS, American Association of Economic Entomologists, Entomological Society of America, and Utah Academy of Sciences, Arts, and Letters. He was President of the USAC Chapter of Phi Kappa Phi from 1934 to 1935.

Professor Sorenson has been an example of integrity, fairness, and whole-hearted cooperation as well as of outstanding achievement to his co-workers and students.

Datus M. Hammond